IDENTIFYING DATA

Mathematics: Statistics

Subject	Mathematics: Statistics			
Code	P03G370V01301			
Study programme	(*)Grao en Enxeñaría Forestal			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	2nd	1st
Teaching language	Spanish Galician			
Department				
Coordinator	Iglesias Pérez, María Carmen			
Lecturers	Iglesias Pérez, María Carmen			
E-mail	mcigles@uvigo.es			
Web	http://webs.uvigo.es/mcigles/			
General description	(*)Esta materia ten como obxectivo proporcionar unha formación estatística básica en descrición de datos, cálculo de probabilidades e inferencia estatística, poñendo o acento nos aspectos aplicados á enxeñaría forestal.			

Competencies

Code	
B1	Ability to understand the biological, chemical, physical, mathematical and representation systems necessary for the development of professional activity, as well as to identify the different biotic and physical elements of the forest environment and renewable natural resources susceptible to protection, conservation and exploitations in the forest area.
C11	Ability to apply knowledge about statistics and optimization. Statistical computer programs of interest in engineering.
D2	Ability to communicate orally and written in Spanish or in English
D5	Capacity for information management, analysis and synthesis
D8	Ability to solve problems, critical reasoning and decision making

Learning outcomes

Expected results from this subject	Training and Learning Results

1R. 2018 Knowledge and understanding of the mathematicians and other inherent basic sciences   B1   C11   D2
to the his speciality in engineering, it a level that allow them purchase the rest of the competitions   D5
of the qualifications.   D8

3R. 2018 Be conscious of the multidisciplinary context of the engineering.

4R. 2018 Capacity to analyze products, processes and complex systems in the his field of study;
choose and apply analytical methods, of calculation and experimental relevantes of form relevante
and interpret correctly the results of these analyses.

5R. 2018 Capacity to identify, formulate and resolve problems of engineering in the his speciality;
choose and apply analytical methods, of calculation and experiments properly established;
Recognize the importance of the social restrictions, of health and security, environmental,
economic and industrial.

10R. 2018 Capacity and capacity to project and realize experimental investigations, interpret
results and obtain conclusions in the his field of study.

11R. 2018 Understanding of the techniques and methods of analysis, project and applicable
investigation and his limitations within the scope of the his speciality.

12R. 2018 practical Competition to resolve complex problems, realize complex projects of
engineering and realize specific investigations stop his speciality.

17R. 2018 Capacity to collect and interpret data and handle complex concepts inside the his
speciality, to issue judgements that involve a reflection on ethical and social questions

19R. 2018 Capacity to communicate of effective way information, ideas, problems and solutions in
the field of the engineering and with the society in general.

21R. 2018 Capacity to recognize the need of a continuous training and realize this activity of
independent way during his professional life.

Contents

Topic	
1. Sampling and descriptive statistics	1.1 Definition and field of application of the Statistics.
	1.2 Basic concepts of sampling. Methods of random sampling.
	1.3 Descriptive Statistics: Measures of position, dispersion and shape.
	1.4 Descriptive Statistics: Tables and graphic representations.
2. Probability	2.1 Random Experiment. Sample space. Events.
	2.2 Probability: concept, properties and methods of determination.
	2.3 Conditional Probability. Independence of events.
	2.4 Fundamental theorems: Product rule, total probabilities and Bayes' rule.
3. Random variables and remarkable distributions	3.1 Concept of random variable (r.v.)
	3.2 Discrete and continuous random variables.
	3.3 Characteristics of a r.v.
	3.4 Models associated to a Bernouilli Process.
	3.5 Models associated to a Poisson Process.
	3.6 The Normal distribution.
	3.7 Other remarkable models.
4. Intervals of confidence	4.1 Estimator: concept and properties.
	4.2 The sample mean, sample variance and sample proportion.
	4.3 Intervals of confidence for the mean, variance and proportion.
	4.4 Calculation of the size of the sample.
	4.5 Intervals of confidence for the difference of two means and two proportions.
5. Test of hypothesis	5.1 Definition and classical methodology of statistical testing: types of hypothesis, type I and type II errors, level of significance, critical region. Power.
	5.2 Critical level or p-value.
	5.3 Test on two means and test on two variances (under normality). Test on two proportions.
	5.4 Test chi-square of independence.
	5.5 Normality test.
6. Introduction to regression models	6.1 Linear association measures: covariance and linear correlation coefficient.
	6.2 The simple linear regression model.
	6.3 Least squares and the fitted model.
	6.4 Properties of the least squares estimators and inference.
	6.5 Analyses of variance and sample coefficient of determination.
	6.6 Model checking.
	6.7 Prediction.
	6.8 Multiple linear regression model.
	6.9 Methods for model selection.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	15	30
Problem solving	15	15	30
Autonomous problem solving	0	32	32
Practices through ICT	14	7	21
Mentored work	3	12	15
Essay questions exam	2	12	14
Laboratory practice	1	7	8

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

Methodologies

	Description
Lecturing	Explanation by the professor of the theoretical foundations, which should be studied outside of class. At the beginning of each topic, students will be provided with notes and material for a better follow-up of the class. The CG1 and CE11 competences are worked on.
Problem solving	Classes in the classroom dedicated to solve exercises, and to propose, solve, analyze or interpret problems. The CG1, CE11, CT8 competences are worked on.
Autonomous problem solving	In each subject students should work on a bulletin to know how to solve problems and similar exercises to those in class. It will also be proposed to investigate questions of interest. Also, students will conduct self-assessment questionnaires at the end of the topics or blocks of the subject. There will also be computer exercises related to laboratory practices. All the competences of the subject are worked on.
Practices through ICT	Management of statistical software by each student. Fundamentally, EXCEL or CALC, and R Commander will be used. In each subject, work will be done on the computer following a script to learn the application, calculation and interpretation of basic statistical techniques. Data files related to the field of Forestry Engineering will be analized. All the competences of the subject are worked on.
Mentored work	The students will organize themselves in work groups to study a case of real data or a simulation. Each group should choose a problem related to the field of Forest Engineering, obtain or simulate data relative to it, describe and analyze them statistically and draw some relevant conclusions. The work will be done mostly outside the classroom, although some parts of preparation and supervision will be in the classroom. Likewise, the presentation of the work will be face-to-face. All the competences of the subject are worked on.

Personalized assistance

Methodologies	Description
Problem solving	The tutorials to resolve any doubt of the subject are in Office 23 of the Escuela de Enxeñería Forestal.
Mentored work	Each group must attend a face-to-face tutoring (at least one) before the presentation of the work.

Assessment

	Description	Qualification	Training and Learning Results		
Autonomous problem solving	The activities (problems, questions, computer exercises) given during the course and the self-assessment questionnaires will be evaluated.	30	B1	C11	D2 D5 D8
Mentored work	Qualification of the content and presentation of the group work.	10	B1	C11	D2 D5 D8
Essay questions exam	Written exam of problems and small questions of theory. You have to take a minimum to compensate (4 out of 10).	40	B1	C11	D8
Laboratory practice	Application of statistical software to data analysis in the computer classroom. You have to take a minimum to compensate (4 out of 10).	20	B1	C11	D5

Other comments on the Evaluation

To pass the subject you must have the two compensable exams and reach a final grade greater than or equal to 5.

In the second call there will be two exams: written and on computer, so that each student retrieves the pending one.
The group work and other activities can not be recovered on second call.

*Exam Data

First announcement: 22 January 2021, 10:00

Second announcement: 1 July 2021, 10:00

The official dates and the possible modifications are avaliable on http://forestales.uvigo.es/gl/

Sources of information

Basic Bibliography

Navidi, W., **Estadística para Ingenieros y Científicos**, Mc. Graw Hill,

Cao Abad, R. y otros, **Introducción a la Estadística y sus aplicaciones**, Pirámide,

Peña, D., **Estadística. Modelos y Métodos. Fundamentos**, Alianza Universidad,

Complementary Bibliography

Alea Riera, V. y otros., **Guía para el análisis estadístico con R Commander**, Barcelona: Universidad de Barcelona,

Pérez López, C., **Estadística aplicada : conceptos y ejercicios a través de Excel**, Madrid : Ibergarceta Publicaciones,

Devore, J., **Probabilidad y estadística para ingeniería y ciencias**, Thomson,

Walpole, R. E. et al., **Probabilidad y estadística para ingeniería y ciencias**, Pearson Educación,

Rodríguez Muñiz, L.J. y otros, **Métodos estadísticos para ingeniería**, Madrid : Garceta,

Framiñán Torres,J.M. y otros, **Problemas resueltos de probabilidad y estadística en la ingeniería**, Universidad de Sevilla,

Susan Milton, J., **Estadística para Biología y Ciencias de la Salud**, McGraw Hill Interamericana,

Ríus, F., Barón, F.J., Sánchez, E. y Parras, L., **Bioestadística: métodos y aplicaciones**, SPICUM (U. Málaga),

http://www.aulafacil.com/Excel/temario.htm,

http://knuth.uca.es/moodle/mod/resource/view.php?id=1126,

https://estadisticaorquestainstrumento.wordpress.com/,

Recommendations

Subjects that it is recommended to have taken before

Mathematics: Overview of mathematics/P03G370V01203
Mathematics: Mathematics and IT/P03G370V01103

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

*Teaching methodologies that are maintained
All teaching methodologies are maintained with synchronous classes through the Remote Campus and with the support of the Faitic teledoaching platform.

*Teaching methodologies that are modified
None

*Non-attendance mechanism for student attention (tutorials)

The tutorials may be carried out by telematic means:
- Email: mcigles@uvigo.es
- Videoconference in Virtual Office of the Remote Campus (requesting an appointment by email):
https://campusremotouvigo.gal/faculty/993
Mª Carmen Iglesias Pérez: Office 1291

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*Modifications (if applicable) of the content to be taught
None

*Additional bibliography to facilitate self-learning
None

*Other modifications
None

=== ADAPTATION OF THE EVALUATION ===

The evaluation is maintained:

Autonomous problem solving (problems, questionnaires and computer exercises): 30%
Supervised work: 10%
Exam of development questions: 40%
Laboratory practice (computer exam): 20%

In each of the exams (written and computer) it is necessary to achieve a minimum grade of 4 out of 10.

In the second call there will be two exams: written and computer, so that each student recovers the one they have pending.
Supervised work and the autonomous activities cannot be recovered on second call.

* Additional information

For the final exams the Remote Campus and the Faitic platform will be used.