Information about the subject

Degree: Bachelor of Degree in Marine Sciences

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 272003 **Name:** Applied Statistics

Credits: 6,00 **ECTS Year:** 2 **Semester:** 1

Module: Transversal Knowledge and Techniques in Marine Sciences

Subject Matter: Statistics **Type:** Compulsory

Department: Oceanography and Environment

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

Transversal Knowledge and Techniques in Marine Sciences

Subject Matter	ECTS	Subject	ECTS	Year/semester
Organisms and Systems	30,00	Marine Botany	6,00	2/2
		Marine Ecology	6,00	3/2
		Marine Microbiology	6,00	2/2
		Marine Zoology	6,00	2/1
		Physiology of Marine Organisms	6,00	2/2
Marine Geology	12,00	Geophysics and Tectonics	6,00	2/1
		Sedimentology	6,00	2/2
Geographic Information Systems and Remote Sensing	6,00	Geographic Information Systems and Remote Sensing	6,00	2/1
Statistics	6,00	Applied Statistics	6,00	2/1

Recommended knowledge

In order to follow the course, it is essential to be able to handle with fluency the basic mathematical techniques that are learned in compulsory and high school.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1   The student summarizes the information obtained by sampling or experimentation, both in Nature and in the laboratory, adapting the graphs to the types of variables being studied.

R2   The student distinguishes the different types of statistical variables which may appear in studies related to Marine Sciences, and the type of graph appropriate to represent each variable.

R3   The student is able to design a suitable procedure for the collection of data (sampling), both on biological populations and in the laboratory, learning to avoid the possible biases that can result from an incorrect data collection process.

R4   The student is able to obtain confidence intervals for the different population parameters (mean, proportion and standard deviation) as well as to know how to correctly interpret the meaning of a confidence interval.

R5   The student is able to raise and resolve the different basic statistical contrasts . In particular, he must know the t-test, the chi-square test and ANOVA of a fixed-effect, completely randomized factor.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB2	Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study.				x
CB5	Students develop the necessary learning skills to undertake further studies with a high level of autonomy.				x

GENERAL		Weighting			
		1	2	3	4
CG1	Capacity to analyze and synthesize			x	
CG2	Capacity to organize and plan			x	
CG3	Mastering Spanish oral and written communication			x	
CG5	Knowing and applying Basic ITC skills related to marine science				x
CG6	Capacity to manage information (capacity to look for and analyze information coming from different types of sources)				x
CG7	Decision making		x		
CG8	Capacity to work in interdisciplinary and multidisciplinary team			x	
CG10	Critical and self-critical capacity			x	
CG11	Capacity to learn			x	
CG12	Capacity to adapt to new situations			x	

		1	2	3	4
CG13	Capacity to produce new ideas (creativity)			x	
CG16	Capacity to apply theoretical knowledge				x
CG18	Sensibility to environmental issues.		x		

SPECIFIC		Weighting			
		1	2	3	4
CE2	Knowing basic sampling techniques of water column, organisms, sediment and sea-bottoms as well as basic techniques of dynamic and structural variable measurement				x
CE6	Applying marine instrument techniques	x			
CE7	Collecting, assessing, processing and interpreting oceanographic data, following the most recent theories				x
CE8	Identifying and analyzing new problems and proposing solution strategies			x	
CE9	Knowing how to carry out experiments and measurements both in the laboratory and during sample collection				x
CE10	Knowing how to use planning, designing and implementing research tools while surveying and assessing results				x
CE11	Knowing how to do fieldwork and laboratory experiments in a safe and responsible way, promoting teamwork	x			
CE12	Describing, classifying and mapping sea bottoms and coastal areas	x			
CE13	Looking for and assessing different kinds of marine resources	x			
CE20	Mastering practical use of models, including new data for validation, improvement and development of models				x

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R5	40,00%	Written test with theoretical and practical questions
R1, R2, R3, R4, R5	20,00%	Delivery of guided assignments, whose objectives and contents will be proposed by the teacher
R1, R2, R3, R4, R5	40,00%	Problem-solving and issues related to the use of specific software

Observations

According to the general evaluation and qualification regulations, the preferred evaluation system will be by means of continuous evaluation. This subject cannot be assessed by means of a single assessment.

The evaluation is divided into two sections:

Section A: Practical Work (50%) – Continuous Assessment
   • After each of the five thematic units, students will complete practical exercises that review, practice, and deepen the understanding of the unit's content.
   • Students work in groups to solve the exercises and submit them after each thematic unit by the specified deadlines to receive a grade.
   • These exercises are completed both in class with the instructor and at home.
   • The exercises may involve computer-based statistical programs or manual mathematical tasks.
Section B: Final Written Exam (50%)
   • The final exam is designed to assess the students' theoretical knowledge and may include multiple-choice questions, true/false questions, open-ended questions, data interpretation, or process descriptions.

Students must achieve a minimum of 40% of the possible points in both sections to qualify for an average grade. Failure to meet this requirement will result in a failing grade for the course, even if the overall average exceeds 5. In such cases, the system will record a grade of 4.5. To pass the course, a minimum average of 5 is required.

The use of tools based on artificial intelligence (AI) is subject to the teacher's criteria, who may establish specific limits or conditions depending on the training or assessment activity.

MENTION OF DISTINCTION:

In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1   Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.

M2   Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.

M6   Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.

M8   Set of oral and/or written tests used in initial, formative or additive assessment of the student.

M9   Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical , practical and/or small-group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es)

M10   Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es).

Course guide

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
ON-CAMPUS CLASS M1	R1, R2, R3, R4, R5	40,00	1,60
PRACTICAL CLASSES M2	R1, R2, R3, R4, R5	15,00	0,60
TUTORIAL M6	R1, R2, R3, R4, R5	3,00	0,12
ASSESSMENT M8	R1, R2, R3, R4, R5	2,00	0,08
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
GROUP WORK M9	R1, R2, R3, R4, R5	18,00	0,72
INDEPENDENT WORK M10	R1, R2, R3, R4, R5	72,00	2,88
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
Descriptive Statistics	Description of samples and populationsTypes of variablesFrequency distributionLocation and dispersion measurements Representation of experimental data by means of statistical graphs.Description of a population: population parameters
Probability	Introduction to probability.Dependent and independent events: Bayes' TheoremRandom sampling: types and characteristicsDiscrete and continuous probability distributions
Sample distribution. Confidence intervals	Distribution in the sample. Confidence intervals Sample distribution: mean, variance, proportion.Distribution in sampling of the difference of sample means: paired and independent samples. Obtaining and interpreting confidence intervals for different population parameters.Determination of the sample size.
Hypothesis contrasts	Hypothesis contrasts: stages.Types of errors in a contrastTest t, test Z, and test chi2. Assumptions for applying these testsConcept of p-value: calculation and meaning

Course guide

ANOVA

Analysis of the variance of a factorANOVA's fundamental relationships: the F testAssumption to apply ANOVAMultiple Comparison Procedures

Organization of the practical activities:

	Content	Place	Hours
PR1.	Descriptive statistics	Computer	4,00
PR2.	Confidence intervals	Computer	4,00
PR3.	t test, ch2 test, Z test and ANOVA	Computer	7,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
Descriptive Statistics	8,00	16,00
Probability	3,00	6,00
Sample distribution. Confidence intervals	4,00	8,00
Hypothesis contrasts	9,00	18,00
ANOVA	6,00	12,00

References

Martín González, Germán. Introducción a la Estadística. Editorial Universidad Católica de Valencia. Valencia 2009.

Wonnacott, T.H., Wonnacott, R.J. Introducción a la Estadística. Editorial LIMUSA, S.A. de C.V. México 1999

Pagano, Marcelo, Gauvreau, Kimberllee. Fundamentos de Bioestadística. Editorial Thomson Editores, S.A. de C.V. México, 2000

García Pérez, Alfonso. Estadística aplicada: conceptos básicos. Editorial UNED. Madrid, 2005

Martín González, Germán. Estadística básica con R. Editorial Universidad Católica de Valencia. Valencia, 2021