Universitat Autònoma de Barcelona

2018/2019

Statistics

Code: 102810
ECTS Credits: 6

Degree	Type	Year	Semester
2501915 Environmental Sciences	OB	2	1

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Jaume Aguadé Bover
Laura Brustenga Moncusi

Prerequisites

It is advisable to have passed the course of Mathematics in the first year.

Objectives and Contextualisation

The objective of this course is to introduce the basic statistical tools to analyze data arising from experiments or observations, focusing on their correct use and the interpretation of the results. The practices with computer of this subject, that are realized with a statistical software package in the computer classroom, are an indispensable part of the course in order to achieve these goals.

Skills

- Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
- Analyze and use information critically.
- Collect, analyze and represent data and observations, both qualitative and quantitative, using secure adequate classroom, field and laboratory techniques
- Demonstrate adequate knowledge and use the tools and concepts of mathematics, computer science and statistics to analyze and manage environmental issues.
- Demonstrate concern for quality and praxis.
- Demonstrate initiative and adapt to new situations and problems.
- Learn and apply in practice the knowledge acquired and to solve problems.
- Teaming developing personal values regarding social skills and teamwork.
- Work autonomously

Learning outcomes

1. Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
2. Analyze and use information critically.
3. Apply mathematical models, both deterministic and random,
4. Calculate probabilities in everyday situations.
5. Demonstrate concern for quality and praxis.
6. Demonstrate initiative and adapt to new situations and problems.
7. Formulate and solve optimization problems related to environmental sciences.
8. Formulate and solve problems of hypothesis testing of one or two populations.
9. Interpret the basic properties of point estimators and interval.
10. Learn and apply in practice the knowledge acquired and to solve problems.
11. Manage and meet random variables earnings per * modelitzar real phenomena.
12. Observe, recognize, analyze, measure and adequately represent mathematical concepts applied to environmental sciences.
13. Recognize real situations in which the most common probability distributions appear.
14. Teaming developing personal values regarding social skills and teamwork.
15. Use computer packages numerical and symbolic computation.
16. Using a statistical package and handle large data sets.
17. Using mathematical tools to describe and solve environmental sciences.
18. Using the concept of independence.
19. Work autonomously

Content

1. Descriptive Statistics. Variability and errors. Precision and accuracy. Descriptive analysis of data from a single variable. Descriptive analysis of data from two variables: the regression line.

2. Probability. Basic properties of probability. Combinatorics. Conditional probability. Independence of events. Bayes Formula. Discrete random variables. Expected value and variance. Continuous random variables. Normal distribution. Approximation of the Binomial by Poisson or Normal distributions. Independence of random variables.

3. Statistics. Introduction to Statistics: population, sample, parameters and estimators. Sampling distributions. Confidence intervals. Introduction to hypothesis tests. Tests for the expected value and for the variance. Tests for the proportion. Tests of comparison of expected values and of variances for two normal populations. Tests of comparisons of two proportions. Khi-Square independence test. Test Q of Dixon for detection of outliers. Normality tests and non-parametric tests.

Methodology

The course consists of:

1. Theory classes (one class group) where the basic concepts of the subject are introduced and the main techniques of statistics are explained, showing examples of their application.
2. Problem solving classes (two groups) where the concepts and statistical tools introduced in the theory classes are put into practice by means of the analysis of concrete examples.
3. Practices at the computer classroom (four groups) where the student will learn to use specific statistical software.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Practices with statistical software	10	0.4	2, 6, 5, 11, 12, 8, 13, 1, 19, 14, 18, 17, 15, 16

Problem solving classes	9	0.36	2, 10, 4, 6, 5, 11, 12, 8, 13, 1, 19, 14, 18, 17
Theory classes	32	1.28	2, 6, 5, 12, 1, 19
Type: Supervised			
Tutoring	10	0.4	10, 6, 5, 13, 1, 14, 17
Type: Autonomous			
Autonomous study	80	3.2	2, 10, 6, 5, 12, 19, 17

Evaluation

The mark of the subject by continuous assessment, AC, will be obtained from:

1. the marks of two partial exams, E1 and E2,
2. the mark of the practice exam with computer, P,

according to the formula: AC = 0.30 E1 + 0.45 E2 + 0.25 P.

The student passes the course if AC is greater than or equal to 5. Otherwise, the student has a recovery exam whose mark, ER, will replace the mark of the two partial examinations, E1 + E2, however the mark P of the practice exam is NOT recoverable. In order to be able to attend the recovery exam, the student must have previously been evaluated of continuous assessment activities that are equivalent to 2/3 of the total.

It is considered that the student presents himself for the evaluation of the course if he has participated in evaluation activities that exceed 50% of the total.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Exam E1	30%	3	0.12	2, 3, 10, 4, 6, 5, 9, 11, 12, 7, 8, 13, 1, 19, 18, 17
Exam E2	45%	3	0.12	2, 3, 10, 4, 6, 5, 9, 11, 12, 7, 8, 13, 1, 19, 18, 17
Practice exam P	25%	3	0.12	2, 10, 6, 5, 12, 1, 19, 14, 17, 15, 16

Bibliography

1. Delgado, R. Probabilidad y Estadística para ciencias e ingenierías, Editorial Delta, 2008.
2. Bardina, X., Farré, M. Estadística descriptiva, Manuals UAB, 2009.
3. Devore, Jay L. Probabilidad y Estadística para ingeniería y ciencias, International Thomson Editores, 1998.
4. Milton. J. S. Estadística para Biología y Ciencias de la Salud, Interamericana de España, McGraw-Hill, 1994.
5. Moore, D. S. Estadística aplicada básica, Antoni Bosch editor, 2000.