

Statistics

Code: 103240
ECTS Credits: 6

Degree	Type	Year	Semester
2501925 Food Science and Technology	FB	1	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: No
Some groups entirely in Spanish: No

Teachers

Marcel Nicolau Reig

Prerequisites

Although there are no formal prerequisites, it is recommended that the student reads up on:

- 1) Elementary combinatorics and the Newton binomial.
- 2) The probability theory and statistics studied in high school.
- 3) Elementary functions (exponential, logarithm), summations.

It is also recommended that the student follows simultaneously the course Mathematics.

Objectives and Contextualisation

Context:

This is a basic course, introducing the tools of probability theory and statistics. Together with the course in mathematics, it also helps students develop scientific rigour and logical thinking.

Objectives:

- 1) fluency in the language of probability and statistics.
- 2) familiarity with descriptive methods in connection with data sets resulting from experiments.
- 3) ability to choose models appropriately.
- 4) familiarity with the concept of random variable, the basic distributions, and which situations they serve.
- 5) methods of statistical inference.
- 6) statistics software.

7) critical spirit when faced with problems, modelling, conclusions, and decision making.

Competences

- Analyse, summarise, resolve problems and make professional decisions.
- Apply knowledge of the basic sciences to food science and technology.
- Apply the scientific method to resolving problems.
- Design experiments and interpret the results.
- Search for, manage and interpret information from different sources.
- Use IT resources for communication, the search for information within the field of study, data processing and calculations.

Learning Outcomes

1. Analyse data using statistical methods and techniques, working with qualitative and quantitative data.
2. Analyse, summarise, resolve problems and make professional decisions.
3. Apply the scientific method to resolving problems.
4. Clean up data: lost data, transformation of variables, anomalous data, case selection and other techniques that precede statistical analysis.
5. Describe the basic properties of point estimators and interval estimators.
6. Describe, using the appropriate graphic and analytical methods, qualitative data on one or more variables.
7. Describe, using the appropriate graphic and analytical methods, quantitative data on one or more variables.
8. Design experiments and interpret the results.
9. Explore behaviour patterns of univariate and bivariate data.
10. Identify and select the most important information sources for the descriptive analysis of data of different types: environmental, healthcare, economic, etc.
11. Identify statistical distributions.
12. Interpret the results obtained and draw conclusions regarding the experimental hypothesis.
13. Search for, manage and interpret information from different sources.
14. Summarise and discover behaviour patterns in data exploration.
15. Use IT resources for communication, the search for information within the field of study, data processing and calculations.
16. Use specific statistical software for the descriptive analysis of data.
17. Use spreadsheets for the descriptive analysis of data.
18. Use statistical inference as an instrument for making predictions.
19. Use statistical software to analyse data using inference techniques.
20. Use statistical software to manage databases.
21. Use statistical software to obtain summary indices of the variables in the study.
22. Use the properties of density functions.
23. Use the properties of distribution functions.
24. Use univariate and bivariate summary indices.
25. Validate and manage information to be processed statistically.

Content

1. Descriptive statistics

Data and error. Descriptive analysis of data from one random variable. Distributions, frequencies, graphical representation, numerical summaries (position, dispersion, form). Descriptive analysis of data from two random variables: correlation, regression line, cross tables.

2. Probability

a) Basic properties of probability. Conditional probability. Total probability and Bayes' formula.

b) Discrete random variables" Bernoulli, Binomial, Poisson.

c) Continuous random variables. The normal distribuion.

3. Statistics

a) Introdutino to Statistics: població and sample, parameters and estimators, independen variables. Sample mean distribution in the normal case with known variance. The Z-statistic. Cofidence interval for the mean of a normal distribution with known variance.

b) Student t-distribution. Case of unknown variance: T-statistic. Confidence interval for the mean of a normal mdistribution with unknown variance. Sample proportion. Assymptotic interval for a propoertion.

c) Introduction to hypothesis testing. Hypothesis test for the mean of a normal distribution with known variance. Hypothesis test for the mean of a normal distribution with unknown variance. Hypothesis test for a propoertion. Test for comparing two means.

d) Goodness of fit test with chi square. Test for independence, test for homogeneity.

Methodology

- Theory classes:

lectures

- Problem classes:

individual or group work, under the supervision of the teacher.

- Computer lab classes:

Work in pairs with a computer, solving exercises.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Computer lab classes	15	0.6	1, 2, 3, 13, 4, 6, 7, 8, 24, 9, 11, 10, 14, 15, 17, 16, 19, 20, 21, 25
Problem classes	15	0.6	1, 2, 3, 13, 6, 7, 8, 24, 9, 11, 18, 12, 14, 22, 23
Theory	22	0.88	1, 2, 3, 5, 6, 7, 8, 24, 11, 18, 12, 14, 22, 23
Type: Supervised			
Tutorials	10	0.4	1, 2, 3, 13, 4, 5, 6, 7, 8, 24, 9, 11, 10, 18, 12, 14, 15, 17, 22, 23, 16, 19, 20, 21, 25
Type: Autonomous			
Self-study and problem solving	73	2.92	1, 2, 3, 13, 4, 6, 7, 8, 24, 9, 11, 10, 18, 12, 14, 15, 17, 22, 23, 16, 19, 20, 21, 25

Assessment

THE CATALAN VERSION IS THE OFFICIAL. THE FOLLOWING IS A SUMMARISED TRANSLATION ONLY.

Two written exams during the semester, together accounting for 70% of the final grade. Further 15% corresponds to homework assignments, and 15% for the computer lab sessions.

It is mandatory to participate in at least 5 out of the 6 sessions.

To pass the course, a total score of 5 out of 10 is required, and for each written exam it is furthermore required to obtain a grade 3 (out of 10).

Students not passing these requirements will take a recovery exam.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Computer lab	15%	1.5	0.06	1, 2, 13, 4, 6, 7, 24, 9, 10, 12, 14, 15, 17, 16, 19, 20, 21, 25
First written exam	35%	3	0.12	1, 2, 3, 13, 5, 6, 7, 8, 24, 9, 11, 18, 12, 14, 22, 23, 25
Homework	15%	4	0.16	1, 2, 3, 5, 6, 7, 8, 24, 9, 11, 18, 12, 14, 22, 23
Recovery exam	70%	3.5	0.14	1, 2, 3, 13, 5, 6, 7, 8, 24, 9, 11, 18, 12, 14, 22, 23, 25
Second written exam	35%	3	0.12	1, 2, 3, 13, 5, 6, 7, 8, 24, 11, 18, 12, 14, 22, 23, 25

Bibliography

1. Delgado, R. Probabilidad y Estadística para ciencias e ingenierías, Editorial Delta, 2008.
<http://www.deltapublicaciones.com>
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.