VNIVERSITAT DE VALÈNCIA

Course Guide
33161 Mathematics II

COURSE DATA

Data Subject	
Code	33161
Name	Mathematics II
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1102 - Degree in Biotechnology	Faculty of Biological Sciences	1	Second term

Subject-matter

Degree	Subject-matter	Character
1102 - Degree in Biotechnology	77 - Mathematics	Basic Training

Coordination

Name	Department
LOPEZ QUILEZ, ANTONIO MANUEL	130 - Statistics and Operational Research

SUMMARY

The course Mathematics II is essential to the formation of any experimental scientist. It is part of the first degree course in Biotechnology and is located in the second semester of the academic year. Its aim is to provide the students with tools and basic statistical concepts which are necessary to recognize simple probability models, statistical hypotheses that represent the objectives of a scientific study, statistical analysis of the data (either by direct observation in nature or as a result of laboratory experiments), and finally draw conclusions about the different sources of uncertainty present in the study.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

OUTCOMES

1102 - Degree in Biotechnology

- Saber expresarse correctamente en términos matemáticos, estadísticos, químicos, físicos y biológicos.
- Emplear correctamente herramientas informáticas de cálculo, análisis y representación de datos (hojas de cálculo).
- Saber aplicar herramientas estadísticas a resultados experimentales.
- Saber manejar el análisis de varianza, regresión lineal y no lineal, y correlación.
- Calcular correctamente los parámetros relevantes de un proceso o experimento mediante representación de datos experimentales.

LEARNING OUTCOMES

- Plan simple experiments useful for achieving the objectives of the proposed study.
- Develop and present a report of the study.
- Describe and adequately represent the data set provided by the experiment.
- To analyze the observed data using appropriate statistical software.
- Correctly interpret the results provided by the software used.
- Ability to work as a team.
- Ability to critically on the conclusions drawn from work or work of others.
- Capacity planning and organization of work.
- Ability to express orally and in writing, findings and conclusions of a statistical analysis.

DESCRIPTION OF CONTENTS

1. Exploratory data analysis.

Populations and samples. Types of variables. Frequency tables. Graphical description of samples. Numerical description of samples: measures of location and dispersion.

2. Inference in a population.

Probability. Description of populations through probabilistic models. Parameters. Estimation and hypothesis testing of the population mean.

3. Comparison of two samples.

Related samples: Design of experiments. The t test and confidence intervals. The sign test. Independent Samples: Design of experiments. The t test and confidence intervals. The Mann-Whitney test.

4. Comparison of several independent samples.

Design of experiments. Analysis of variance and a posteriori comparisons. The Kruskal-Wallis.

5. Analysis of categorical data.

Analysis of proportions. Goodness of fit. Contingency tables.

6. Linear regression.

Interpretation of the parametric regression: the linear model. Statistical inference on the slope. Correlation coefficient

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	31,00	100
Computer classroom practice	26,00	100
Tutorials	3,00	100
Study and independent work	50,00	0
Preparation of evaluation activities	15,00	0
Preparation of practical classes and problem	25,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The teaching methodology is based on lecture classes. The various components and statistical procedures will be introduced through real examples following conceptual and applied presentations. Conceptual because our goal is to understand the basic methodology of the statistical inference. And applied because our intention is to connect the statistical procedures with the context of real applications.

Practice sessions with the students as the main protagonists will be synchronized with the theory in computer labs. Students will apply and discuss the theoretical procedures introduced in the lectures on real problems and biotechnological applications.

Students have a basic set of materials which are always available in the Virtual Classroom: an extensible schema for each of the topics explained in the lectures, a written document for each practice which will be useful to establish and reinforce the acquired knowledge, and a collection of exercises and problems designed to enhance and reinforce learning.

Tutorial sessions in small groups will discuss and focus the concepts discussed so far.

Assistance to various academic activities is not mandatory in any case. However, both the attendance and active participation in the lectures and practices is highly desirable.

EVALUATION

Evaluation is achieved through:

1- A theoretical and practical examination which will require the resolution of problems, issues and interpretation of various results presented in the standard format of statistical software used for the course (up to 7.0 points; 70% of final mark).

2- Questions relating to the material worked in the practical sessions to ask in a grup of 2 or 3 members (up to 3.0 points; 30% of final mark).

To pass the course will be necessary to obtain an overall score greater than or equal to 5 points, of which at least 3 points should correspond to part 1.

The marks obtained in part 2 shall be kept only in the two official calls for the academic year of reference.

REFERENCES

Basic

- Samuels, M.L., Witmer, J.A. y Schaffner, A. (2012). Fundamentos de Estadística para las Ciencias de la Vida (4a ed.) Pearson Educación.

Additional

- Hawkins, D. (2005). Biomeasurement, Understanding, analysing, and communicating data in the Biosciences. Oxford University Press.

Moore, D. (1995). Estadística aplicada bàsica. Antonio Bosch editor.

Van Emden, H. (2008). Statistics for terrified biologists. Blackwell Publishing.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

The teaching plan distribution and the relationship between in-class and non presential activities may be modified throughout the course period if it is required because of the health emergency conditions by Covid-19.

Teaching methodology:

First several sessions of the Computer Practices activity will be held, in small groups, at the corresponding computer lab. Other sessions will be held online through the Virtual Classroom and using the BBC synchronous videoconference system.