COURSE DATA

DATA SUBJECT

Code: 33161
Name: Mathematics II
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1111 - Grado en Biotecnología	Facultat de Ciències Biològiques	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1111 - Grado en Biotecnología	Mathematics	BASIC

COORDINATION

CREUS MARTI IRENE

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

COMPETENCES / LEARNING OUTCOMES

1102 -

Calcular correctamente los parámetros relevantes de un proceso o experimento mediante representación de datos experimentales.

Emplear correctamente herramientas informáticas de cálculo, análisis y representación de datos (hojas de cálculo).

Saber aplicar herramientas estadísticas a resultados experimentales.

Saber expresarse correctamente en términos matemáticos, estadísticos, químicos, físicos y biológicos.

Saber manejar el análisis de varianza, regresión lineal y no lineal, y correlación.

1111 - Grado en Biotecnología

Actuar con autonomía en el aprendizaje, tomando decisiones fundamentadas en diferentes contextos, emitiendo juicios en base a la experimentación y el análisis y transfiriendo el conocimiento a nuevas situaciones

Apply analytical, synthetic and critical thinking skills in the application of the scientific method.

Colaborar eficazmente en equipos de trabajo, asumiendo responsabilidades y funciones de liderazgo y contribuyendo a la mejora y desarrollo colectivo

Demostrar razonamiento crítico y autocrítico en el ámbito de la titulación, considerando aspectos tales como la ética profesional, los valores morales y las implicaciones sociales de las diferentes actividades realizadas

Design prospective market research for a biotechnological product.

Participate in multidisciplinary teams, engaging in teamwork and collaboration.

Que el estudiantado demuestre su capacidad para calcular correctamente los parámetros relevantes de un proceso o un experimento mediante la representación de los datos experimentales

Que el estudiantado demuestre su capacidad para utilizar herramientas matemáticas y estadísticas para la resolución de problemas biológicos

Que el estudiantado demuestre su capacidad para utilizar las diferentes fuentes bibliográficas y bases de datos biológicos y usar las herramientas bioinformáticas

Saber comunicarse de manera efectiva, tanto de forma oral como escrita, adaptándose a las características de la situación y de la audiencia

Saber describir el proceso de inferencia estadística sobre una población a partir de una muestra, la estimación de parámetros poblacionales de interés y la distribución en el muestreo asociada al estimador de un parámetro.

Solve differential and integral equations.

Use English to write reports and to interpret information from protocols, manuals and databases.

Use mathematical language and identify and solve mathematical problems in biology.

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

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	3,00
Theory	31,00
Computer classroom practice	26,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	50,00
Preparation of lessons	25,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
Total hours	**90,00**

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). This part cannot be retaken in the second examination period.

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

- Hawkins, D. (2005). Biomeasurement, Understanding, analysing, and communicating data in the Biosciences. Oxford University Press.
- Moore, D. (1995). Estadística aplicada bàsica. Antonio Bosch editor.
- Samuels, M.L., Witmer, J.A. y Schaffner, A. (2012). Fundamentos de Estadística para las Ciencias de la Vida (4a ed.) Pearson Educación.
- Van Emden, H. (2008). Statistics for terrified biologists. Blackwell Publishing.