COURSE DATA

Data Subject	
Code	34188
Name	Mathematics II
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Faculty of Chemistry	1	Second term

Subject-matter

Degree	Subject-matter	Character
1110 - Degree in Chemistry	3 - Matemáticas	Basic Training

Coordination

Name	Department
YAÑEZ AVENDAÑO, DIONISIO FELIX	363 - Mathematics

SUMMARY

Mathematics II, taught in year 1 of the Degree in Chemistry, is designed as an instrumental subject to provide theoretical knowledge and practical techniques on data processing, both numerical and statistical, and statistical and numerical methods to be used in a multitude of contexts in scientific activities in general and in chemistry in particular.

The focus is on solving chemical problems using laboratory data, which will allow students to obtain valid conclusions from the data obtained in laboratory experiments.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

There are no prerequisites.

OUTCOMES

1108 - Degree in Chemistry

- Develop capacity for analysis, synthesis and critical thinking.
- Show inductive and deductive reasoning ability.
- Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation.
- Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.
- Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate.
- Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional.
- Solve qualitative and quantitative problems following previously developed models.
- Evaluate, interpret and synthesise chemical data and information.
- Interpret data from observations and measurements in the laboratory in terms of their significance and the theories that underpin them.
- Relate theory and experimentation.
- Relate chemistry with other disciplines.
- Prepare reports, surveys and industrial and environmental projects in the field of chemistry.
- Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.
- Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.
- Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.

LEARNING OUTCOMES

The previous section includes the competences contained in the document VERIFICA. This subject addresses part of the learning results of the subject Mathematics II that allow to acquire both specific knowledge of chemistry, cognitive skills and general skills recommended by the EUROPEAN CHEMISTRY THEMATIC NETWORK (ECTN) by the Chemistry Eurobachelor® Label. The following table lists the learning outcomes acquired in the subject Mathematics II related to the competences of the degree in Chemistry.

COMPETENCES AND COGNITIVE SKILLS	
The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject Mathematics II that contemplate the learning outcomes EUROBACHELOR®
Ability to calculate and process data, related to information and chemistry data.	**C1:** Solve qualitative and quantitative problems following previously developed models..(CE14). **C2:** Recognise and analyse new problems and plan strategies to solve them..(CE15).

GENERAL COMPETENCES	
The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject Mathematics II that contemplate the learning outcomes EUROBACHELOR®
Ability to apply practical knowledge to solve	**C1:** Solve problems effectively..(CG4).

problems related to qualitative and quantitative information.	**C2:** Solve qualitative and quantitative problems following previously developed models..(CE14). **C3:** Relate theory and experimentation..(CE22). **C4:** Recognise and evaluate chemical processes in daily life..(CE23). **C5:** Understand the qualitative and quantitative aspects of chemical problems..(CE24).
Calculation and arithmetic capabilities, including aspects such as analysis error, estimates of orders of magnitude, and correct use of the units.	**C1:** Develop capacity for analysis, synthesis and critical thinking.. (CG1). **C2:** Show inductive and deductive reasoning ability..(CG2). **C3:** Solve problems effectively..CG4).
Ability to adapt to new situations and make decisions.	**C1:** Demonstrate the ability to adapt to new situations..(CG9). **C2:** Recognise and analyse new problems and plan strategies to solve them..(CE15). **C3:** Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration..(CB3).
Skills related to information technology such as word processing, spreadsheet, recording and storage of data, internet use related to the subjects.	**C1:** Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate..(CG6). **C2:** Have basic skills in the use of information and communication technology and properly manage the information obtained.(CT2).

At the end of the course, the student must be able to:

• Know how to apply the mathematical principles necessary for deducing the relationships between the different physicochemical variables and functions presented in the subject areas of Chemistry and Chemical Engineering.

• Estimate the final error of a magnitude value and its reliability margin, after a process of experimental direct or indirect measuring.

• Manage information in an effective manner.

• Use information and communication technologies in an effective manner.

• Demonstrate the ability to organise and plan.

• Solve problems by means of computer software with programming tools.

• Carry out the tasks assigned as a member of a team effectively and from a gender perspective.

• Demonstrate the ability to relate chemistry with other disciplines and to interpret quantitative data.

• Write and present one's work correctly in the native language.

DESCRIPTION OF CONTENTS

1. Statistical Sampling Theory

Random sampling. Binomial, Poisson, normal and deducted distributions. Statistical distributions. Statistical treatment of errors. Confidence intervals. Contrast of hypothesis.

2. Polynomial interpolation

Existence and uniqueness of the interpolating polynomial. Resolution of linear systems. Lagrange interpolation. Newtons interpolation: divided differences. Other interpolating techniques.

3. Numerical integration

Review of integration. Newton-Cotes formulas for numerical integration. Trapezoidal and Simpson rules. Error formulas.

4. Numerical methods for EDOs

Resolution of EDOs (separable variables, linears in general, homogeneous, exacts, non linear of type Bernoulli). Eulers method, improved Eulers method and Runge-Kuttas methods.

5. Practice 1

Use of general software for mathematical calculation and introduction to descriptive statistics. Statistical inference: confidence intervals.

6. Practice 2

Hypothesis testing: test for the mean, comparison of means of different populations.

7. Practice 3

Polynomial interpolation. Programming of methods of interpolation. Obtaining results. Estimation of errors.

8. Practice 4

Numerical integration (integrals and EDOs). Programming of numerical methods of integration. Obtaining results. Example of analytic solving of EDOs.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	41,00	100
Computer classroom practice	12,00	100
Tutorials	7,00	100
Development of group work	15,00	0
Study and independent work	30,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Contents will be delivered in theory and practical classes, and also in tutorials and seminars as specified in the workload section. The theory classes will introduce statistical and numerical methods, with special emphasis on their application to practical cases.

The theory lectures must be participatory, with the presentation of examples by the lecturer and the proposal of others to be developed by students.

Practical classes will take place in a lab so that students learn how to use the computer tools that are appropriate to implement the theoretical concepts into practical cases. In the practical classes the lecturer will propose some exercises to assess the knowledge acquired by students.

Tutorials will be devoted to solving doubts and to clarify the concepts that students require for their effective acquisition of knowledge. Examples and problems may also be used to complete the theoretical and practical training offered and to discuss and debate on the various possible ways to solve a given problem.

In seminars the lecturer will present supplementary aspects, either theoretical or applied, related to the contents and skills introduced in the course.

EVALUATION

A written test will be held to assess the knowledge assimilated in theoretical lectures, contributing 50% of the final mark. Practical skills will be assessed by adding the marks obtained in practical classes (either by direct assessment of practicals or by assessing the projects submitted during the course and before the first examination sitting), up to a maximum of 4 points (which can be carried forward for the second examination sitting), and the mark obtained in a computer-based test, held in the computer room, to evaluate the practical and applied knowledge acquired by students (up to a maximum of 6 points). The practical component contributes 40% of the final mark.

An additional point can be awarded at the discretion of the lecturer for attendance, participation in class, resolution of problems and achievement of learning objectives.

The second examination sitting will involve retaking the written theory test and the individual computer-based test (only the test failed at first attempt or both).

A minimum of 5 points (out of 10) both in the theory and of 4 in the practical components is required for results to be considered towards the final mark. In other case, the subject will be marked as failed.

Final warning

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), "*it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents*".

REFERENCES

Basic

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Additional

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