VNIVERSITAT DE VALÈNCIA

Course Guide
34187 Mathematics I

COURSE DATA

Data Subject	
Code	34187
Name	Mathematics I
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	First term

Subject-matter

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

Coordination

Name	Department
FALCO BENAVENT, FRANCISCO JAVIER	15 - Mathematical Analysis
SEGURA DE LEON, SERGIO	15 - Mathematical Analysis

SUMMARY

The subject Mathematics I is part of the basic knowledge module which, together with the subject Mathematics II, make up the subject area of Mathematics of the Degree in Chemistry, and which provide the specific training required by students in this Degree.

The contents covered in this subject are essential for the proper understanding of many other subjects of the Degree in Chemistry.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

To successfully complete this subject, students should know the contents of Mathematics I and II taught in upper secondary education.

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 I 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 I related to the competences of the degree in Chemistry.

GENERAL COMPETENCES	
The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject Mathematics I that contemplate the learning outcomes EUROBACHELOR®
Ability to apply practical knowledge to solve problems related to qualitative and quantitative information.	**C1:** Solve problems effectively..(CG4). **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).
Interpersonal skills to interact with other people and get involved in team work.	**C1:** Demonstrate ability to work in teams both in interdisciplinary teams and in an international context (CG5). **C2:** Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional (CG7). **C3:** Demonstrate the ability to adapt to new situations (CG9).

All these results will allow the student, after passing the subject, to be able to:

- Dispose with the necessary mathematical basis in order to be able to understand those aspects of Physics and Chemistry which are not merely conceptual and need operative tools to deduce the relations among variables and functions.

- Provide with the necessary mathematical knowledge in order to rigorously handle theoretical aspects of Physics, Chemistry and Chemical Engineering which may be needed.

- Acquire and accomplish with an appropriate use of mathematical calculus.

- Develop in the student the possibility of accurate mathematical reasoning with an applied perspective.

- Correct manipulation of the basic principles of Differential and Integral Calculus.

- Be able to solve some ordinary differential equations.

DESCRIPTION OF CONTENTS

1. Complex numbers

Operations with complex numbers. Factorisation of polynomials. Trigonometry.

2. Differential calculus in several variables.

Calculation of derivatives. Taylor expansions for functions of one variable. Partial derivatives and directional derivatives. The gradient vector. Tangent plane to a surface. Derivative of a composition (chain rule) and implicit derivatives.

3. Integration of functions of several variables.

Calculation of antiderivatives. The definite integral. Calculation of plane areas. Double integral. Change of variables in a double integral. Polar coordinates. Calculation of volumes.

4. Ordinary differential equations.

Basic concepts. Some first order differential equations: Modelling. Introduction to higher order differential equations.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	41,00	100
Computer classroom practice	12,00	100
Tutorials	7,00	100
Development of individual work	20,00	0
Study and independent work	50,00	0
Preparation of evaluation activities	10,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

Theory contents and practical tools for the resolution of problems will be gradually introduced and developed. The concepts presented in the lectures will be applied to answer possible questions and to problem solving.

A series of results, questions and problems will be proposed for students to prepare a project. This project will be supervised and assessed. In tutoring sessions, the problems proposed will be reviewed. Also in these sessions, students will present their solutions to the problems proposed.

A computer software pack for symbolic calculus will be used to supplement the theory lectures, both visually and conceptually and as regards problem solving. This should also be useful as an experimentation method which may provide an improvement of intuitive knowledge.

EVALUATION

Each student will be required to demonstrate knowledge of the basic concepts of the subject and demonstrate sufficient skills in the area through a written exam in which their capacity for solving problems and exercises will be assessed.

The exam will contain one or two questions related to basic concepts; To pass the course it is mandatory to answer them correctly.

The mark obtained in this exam will contribute 80% of the student's final mark. The exam will normally be the same for all groups. Participation in the tasks proposed by the lecturer will be taken into consideration; these tasks will account for 10% of the final mark. Assessment of the computer-aided sessions will be based on attendance, participation and learning; this component will contribute 10% of the final mark.The same assessment system will be applied for the second examination sitting. For the second examination sitting the marks corresponding to the tasks and the computer-aided sessions are maintained. Both activities can't be regraded.Students who are unable to attend the usual lectures will be assessed based on a final written exam andon the individual assignments that they submit to the lecturer whe never required. The mark awarded for practical course work in the computer room may be transferred from the immediately previous academic year at the request of the student.

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

- LARSON,R. E., HOSTETLER, R. P., EDWARDS, B. H. Cálculo y Geometría Analítica (6a ed.). Ed. McGraw-Hill, 1999. 1216 p. ISBN 8448122291 (v.1) 8448123530 (v.2)
- MARSDEN, J. E, TROMBA, A. J. Cálculo Vectorial. Ed. Addison-Wesley, 1991. 665 p. ISBN 0201629356

- STEINER, E. Matemàticas para las Ciencias Aplicadas. Ed. Reverté, 2005. 610 p. ISBN 9788429151596
- STEWART, J. Cálculo multivariable. Ed. Thomson Learning, 2003. 510 p. ISBN 9706861238

Additional

- APOSTOL, T. M. Calculus Ed. Reverté, 1985. 813 p. ISBN 997151396X
- DEMIDOVICH, B. 5000 Problemas de Análisis Matemático (9a ed., reprint) Thomson, 2002. 600 p. ISBN 9788497321419