

**COURSE DATA****Data Subject**

Code	34187
Name	Mathematics I
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

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

Subject-matter

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

Coordination

Name	Department
FERRER LLOPIS, JESUS	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 - Grado de Química

- 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. 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 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 and on the individual assignments that they submit to the lecturer when 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.



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. Matemàtiques 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

ADDENDUM COVID-19

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

Contents

- 1.- *The contents initially indicated in the teaching guide are maintained.*
- 2.- *Other scenarios. If this option is to be pointed out, it must be justified and the actions envisaged.*

Workload and temporary teaching planning

Regarding the workload:

- 1.- *The different activities described in the Teaching Guide are maintained with the intended dedication.*
- 2.- *The different activities described in the Teaching Guide are maintained but the hours of dedication to each activity are changed. (If this option is noted, the table of the workload of the subject distributed by activities and dedication must be included).*
- 3.- *Some of the activities described in the Teaching Guide are eliminated. (If this option is noted, the table of the workload of the subject distributed by activities and dedication must be included).*

Regarding the temporary teaching planning:



1.- *The material to follow the theory/tutoring/classroom-seminar classes allows to continue the temporary teaching planning both in days and schedule, whether the teaching is face-to-face in the classroom or not.*

2.- *The material to follow the theory/tutoring/classroom-seminar classes allows to continue the temporary teaching planning both in days and schedule, whether the teaching is face-to-face in the classroom or not, although in some of the activities the student has the freedom to follow the non-face-to-face sessions according to his own planning.*

3. **Only in laboratory courses:** indicate whether there is any variation with respect to the teaching guide.

Teaching Methodology

Situation of minimal attendance: In theory classes and tutorials the occupation will be, at most, 30% of their usual occupation. Teaching will be online. Students who have a laboratory session before or after theory classes, and the time to travel is longer than the time established in the schedules, will be able to follow the class in person in the classroom assigned in the schedules. When there are students in this situation, classes will be taught by synchronous videoconference in the group classroom.

Maximum face-to-face situation: In theory classes and tutorials, the occupation will respect the sanitary restrictions that limit the capacity of the classrooms. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary that part of the students have to follow the classes synchronously. If this situation arises, the students will attend the group classroom in weekly rotating shifts (preferably in alphabetical order), so as to ensure that the percentage of attendance of all the students enrolled in the subject is the same.

Confinement situation: If for health reasons it is not possible to continue with hybrid teaching, totally or partially affecting the classes of the subject, these will be replaced by synchronous non-face-to-face sessions following the established schedules and using the virtual classroom tools.

Evaluation

1. *The possibility of exam-only evaluation is eliminated.*

2. *The evaluation system described in the Teaching Guide of the subject in which the various evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained.*

If there is a closure of the facilities for health reasons affecting the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade of the subject will remain unchanged, as set out in this guide.



References

- 1.- *The literature recommended in the Teaching Guide is maintained since it is accessible.*
 - 2.- *The literature recommended in the Teaching Guide is maintained since it is accessible, and it is complemented by notes, slides and problems uploaded to the Virtual Classroom as material of the course.*
 - 3.- *Other. If this option is to be noted, the planned actions need to be described.*
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