COURSE DATA

DATA SUBJECT

Code: 34745
Name: Mathematics III
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	Escola Tècnica Superior d'Enginyeria	1	Second quarter
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	Mathematics	BASIC
1934 - Double Degree Program in Chemistry-Chemical Engineering	Segundo curso	COMPULSORY

COORDINATION

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BAEZA MANZANARES ANTONIO

SUMMARY

The subject is conceived as an introduction to numerical and statistical analysis. The aim is for the student to become aware of the need to attack certain problems in an approximate way, and of the mathematical tools that can be used to do so. In particular, it is intended to familiarize students with the numerical methods commonly used in the resolution of engineering problems related to: interpolation and approximation, linear and nonlinear equations, numerical integration and differential equations. Likewise, it is intended that the student knows and understands basic concepts in statistical inference and optimization of interest in engineering.

The main thematic subjects are: **Numerical Methods, Statistics and Optimization.**

The general objectives of the course are the following:

- To understand the concept of approximation to the solution of a problem.
- To identify those situations that require a numerical method in order to obtain a solution.
- To acquire the ability to structure a discrete problem in order to be able to solve it using a programming language.
- To learn to question the validity and or the fiability of the results obtained.
- To stablish conections with other subjects of interest in engineering appplications.

Observations: The classes will be taught in the language as stated in the course sheet available on the website of the degree.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

It is recommended to know the contents of the cours Mathematics I.

COMPETENCES / LEARNING OUTCOMES

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Acquire knowledge of basic and technological subjects to facilitate the learning of new methods and theories, and develop the versatility to adapt to new situations.

Act autonomously in learning, make informed decisions in different contexts, issue judgements based on experimentation and analysis and transfer knowledge to new situations.

Collaborate effectively in work teams, assume responsibilities and leadership roles, and contribute to collective improvement and development.

Solve mathematical problems that may arise in engineering and apply knowledge of linear algebra, geometry, differential geometry, differential and integral calculus, differential equations and partial differential equations, numerical methods, numerical algorithms, statistics and optimisation.

Solve problems with initiative, make decisions, think creatively and critically, and communicate and convey knowledge, skills and competences in the field of industrial engineering.

DESCRIPTION OF CONTENTS

1. Numerical methods for the solution of nonlinear equations.

Roots of nonlinear equations. Methods of bisection and Newton.

2. Polynomial Interpolation.

Construction of the interpolating polynomial for tables. Error bounds for the interpolation error.

3. Numerical methods for the solution of linear systems.

The LU decomposition and its use in the solution of linear systems. Introduction to iterative methods for the solution of large linear systems.

4. Numerical Integration.

Integration rules. Error bounds for numerical integration.

5. Numerical Methods for ordinary differential equations.

The Euler method. Convergence of a numerical scheme. Convergence order. First order schemes versus higher order schemes.

6. Inference and decision.

Random variables and associated density functions. Confidence Intervals.

7. Regression.

Linear and nonlinear regression. Goodness of fit.

8. Basic convex optimization.

Basic convex optimization.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	15,00
Laboratory	30,00
Classroom practices	15,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	10,00
Preparation of lessons	40,00
Preparation for assessment activities	25,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The professor will explain the theoretical concepts to the class, including simple applications.

In the practice classes, the student will be asked to solve exercises, alone or in small groups, under the guidance of a professor.

In the laboratory, the student shall use the gained knowledge to solve more complex problems, for which the use of a computer is necessary or appropriate.

The work in groups would be prometed through the presentation of reports.

EVALUATION

The evaluation procedure of the knowledgement and skills obtained by the students will be done during the whole period and consists of the following evaluation blocs:

1. Evaluation exam or exams of the theoretical-practical contents of the subject, with up to 50% of the final grade of the course.

2. Continous evaluation of the participation in the practical laboratories of the subject, elaboration of lab diary. For this evaluation, one or more exams will be carried out. Moreover, the professor can ask for presentation of specific works and lab diaries to complete the evaluation. Total evaluation of all the activities in this part is up to 50% of the final grade of the course. Assistance to laboratory sessions is a no recoverable activity and obligatory in order to pass the subject.

3. Assistance to theoretical classes, practical classes and participation in the development of the subject will have, according to the professor opinion, up to 10% of the final grade of the course.

The final grade of the subject will be computed from the qualifications of the previous parts, according to the established percentages by the professor, if the qualifications from points 1 and 2 pass 40% of the maximum in each of the previous parts qualification.

The qualification of the exercises and/or specific works is non recoverable and will be kept for the two convocatories of each academic course.

Anyhow, the evaluation system will be based on the guides stated in the Reglament d'Avaluació i Qualificació de la Universitat de València per a Graus i Màsters (ACGUV 108/2017).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020)

REFERENCES

- Métodos Numéricos: Introducción, Aplicaciones y Programación. A. Huerta, J. Sarrate, A. Rodriguez-Ferrer. Edicions UPC.
- Análisis Numérico. Burden y Faires. Thomson Learning.
- Curs d'Estadística. Colomer Mª Àngels. Ed. Universitat de Lleida, 1997.
- Problemas resueltos de Métodos Numéricos. A. Cordero, J.L. Hueso, E. Martínez, J.R.Torregrosa, Ed. Thomson.
- Aproximació Numèrica. S. Amat, F. Aràndiga, J.V. Arnau, R. Donat, P. Mulet, R.Peris. P.U.V.
- Mètodes Numèrics per a l'àlgebra lineal. F. Aràndiga, R. Donat, P. Mulet. P.U.V.
- Càlcul Numèric. F. Aràndiga, P. Mulet. P.U.V.
- Linear and Nonlinear Programming, 2009. David G. Luenberger, Yinvu Ye.
- Estadística Aplicada Básica. Moore David S.Ed. Antoni Bosch, 1998.