COURSE DATA

DATA SUBJECT

Code: 34160
Name: Computational tools
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Facultat de Ciències Matemàtiques	1	Second quarter
1928 - Double Degree Program Physics-Mathematics	Facultat de Ciències Matemàtiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1107 - Degree in Mathematics	Information technology	BASIC
1928 - Double Degree Program Physics-Mathematics	Primer Curso (Obligatorio)	COMPULSORY

COORDINATION

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SUMMARY

The purpose of the subject Computer Tools is the provision of those specific computer skills needed by the student along the degree in mathematics. It is, therefore, an eminently methodological subject, in the sense of the above provision, but by no means devoid of specific mathematical contents such as athematical analysis, basic linear algebra and solving linear and nonlinear equations, from the computational chniques which are illustrated, either symbolic or numeric. Through the presentation by the student or exercises and assignments, you will be entered into the system using LaTeX for scientific writing with mathematical language.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

The necessary basic knowledge for the start of this course will have completed courses in computer science, mathematical analysis and linear algebra I and geometry.

COMPETENCES / LEARNING OUTCOMES

1107 - Degree in Mathematics

Ability to work in teams.

Adapting to new situations.

Apply the knowledge in the professional world.

Capacity for analysis and synthesis.

Capacity for organization and planning.

Capacity of abstraction and modeling.

Expressing mathematically in a rigorous and clear manner.

Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.

Learn autonomously.

Participate in the implementation of software and learn mathematical software.

Reason logically and identify errors in the procedures.

Solve problems that require the use of mathematical tools.

Visualize and interpret the solutions obtained.

DESCRIPTION OF CONTENTS

1. Scientific text processing (LaTeX)
- Introduction to LaTeX language.
- Environments and online tools for LaTeX

2. Basic algorithms in Matlab
- Introduction to Matlab programming.

- Basic matrix calculation.
- Algorithms for solving nonlinear equations.

3. Numerical computing and representation with finite precision.
- Representations of integer numbers.
- Representations of real numbers.
- Sources of error in numerical computations

4. Symbolic computation.
- Introduction to symbolic computation with Matlab or equivalent.
- Representation, differentiation and integration of functions of one variable.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	22,50
Other activities	7,50
Computer classroom practice	30,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	5,00
Independent study and work	7,50
Preparation of lessons	57,50
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the course is structured around three axes: the theory sessions, practical sessions (in the classroom with computer) and tutorials and seminars.

As for the former, the teacher will develop the main agenda items, using computer classroom wherever necessary to illustrate a particular point. The student must attend at the time of preparation of the classes scheduled for their optimal use.

The practical classes so that students will check the level of acquired knowledge, facing relatively complex problems and analyzing the results. As before, students must prepare such sessions to perform experiments within the scheduled time.

EVALUATION

Learning assessment of knowledge and skills achieved by students will be done continuously throughout the course and will consist of the following blocks of assessment:

1. Theory and practice: since the objectives of the course Computer Tools focus on the strengthening of computer calculation techniques, this evaluation will be conducted in two stages:

- Continuous assessment of participation and reporting, with code results and comments in the practice sessions, and/or assessment tests on the contents of the practice sessions (up to 4 points, ie, 40% of the final grade).
- Final evaluation, consisting of a theoretical and practical examination rated up to 5 points, i.e., 50% of the final grade.

2. Seminars and tutorials: a maximum score of 1 point, i.e., 10% of the final grade.

To pass the course it is necessary that the score of subfield 1.ii exceeds 50% of its maximum score.

Grades earned in paragraph 1.i be kept in the two calls of the academic year in which they are made, since its assessment would only be possible throughout the semester and never in the extraordinary call.

REFERENCES

- Oetiker, Tobias; Partl, Hubert; Hyna, Irene; Schlegl, Elisabeth. La introducción no-tan-corta a LATEX 2e. Documento libre, 2014.
- Departamento de Matemáticas, Universidad de Oviedo. Manual de uso de Matlab. Curso 2010-2011. Documento libre, 2011.
- Rodríguez Muñoz, Adrián. Álgebra Lineal Numérica. Documento libre, 2019. Apuntes asignatura UPC, obtenidos en https://dafme.upc.edu/ca/apunts/apunts-gm.
- Amat, S.; Aràndiga, F.; Arnau, J.V.; Donat, R.; Mulet, P.; Peris, R. Aproximació Numèrica. PUV, 2002.
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Complementary references:

- Grätzer, George. Practical LaTeX. Springer, 2014.
- Grätzer, George. More math into LaTeX. 5ª Edición, Springer, 2016.

- Cordero, Alicia. Métodos numéricos con MATLAB, València: Ed. UPV, 2005.
- Gilat, Amos. Matlab. Una introducción con ejemplos prácticos. Barcelona, Ed. Reverté, 2ª Edición, 2006.
- Karris, Steven T. Numerical analysis using matlab and excel, Orchard Pubblications, 3ª Edición, 2007.
- Langtangen, Hans Petter; Linge, Svein. Programming for Computations - MATLAB/Octave. Springer, 2016.