Course Guide
34160 Computational tools

COURSE DATA

Data Subject	
Code	34160
Name	Computational tools
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	1	Second term
1928 - D.D. in Physics-Mathematics	Double Degree Program Physics and Mathematics	1	First term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	7 - Information technology	Basic Training
1928 - D.D. in Physics-Mathematics	1 - Primer Curso (Obligatorio)	Obligatory

Coordination

Name	Department
BAEZA MANZANARES, ANTONIO	255 - Applied Mathematics
JORNET SANZ, MARC	363 - Mathematics
YAÑEZ AVENDAÑO, DIONISIO FELIX	363 - Mathematics

SUMMARY

The purpose of the subject of Computer Tools subject 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 functional calculus, basic linear algebra and solving linear and nonlinear equations, from the computational techniques which are illustrated, whether 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.

OUTCOMES

1107 - Degree in Mathematics

- Capacity for analysis and synthesis.
- Capacity for organization and planning.
- Solve problems that require the use of mathematical tools.
- Ability to work in teams.
- Learn autonomously.
- Adapting to new situations.
- Apply the knowledge in the professional world.
- Expressing mathematically in a rigorous and clear manner.
- Reason logically and identify errors in the procedures.
- Capacity of abstraction and modeling.
- Participate in the implementation of software and learn mathematical software.
- Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.
- Visualize and interpret the solutions obtained.

LEARNING OUTCOMES

Introduction to general programs of symbolic computation: Mathematica, MatLab or equivalent.

lntroduction of the idea of precision in the calculations and the knowledge of numerical representation in the computer to control such accuracy.

Deepening the knowledge of MatLab through basic issues as the basic matrix calculation and the solution of nonlinear equations.

Introduction to the LaTeX system for scientific writing with symbology of mathematical language.

DESCRIPTION OF CONTENTS

1. Edition of scientific texts (LaTex)

Introduction to LaTeX language

Integrated environments and online tools for LaTeX

2. Basic algorithms in MatLab

Introduction to Matlab programming.

Basic matrix calculation.

Algorithms for solving nonlinear equations.

3. Representations and numerical calculations 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 Mathematica, Matlab or equivalent.
Representation, differentiation and integration of functions of one variable

WORKLOAD

ACTIVITY	Hours	% To be attended
Computer classroom practice	30,00	100
Theory classes	22,50	100
Other activities	7,50	100
Development of group work	5,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	32,50	0
Preparation of practical classes and problem	25,00	0
TOTAL	**142,50**	

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 regards the former, the teacher will develop the main agenda items, using computer classroom where 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 in the schedule.

EVALUATION

Learning assessment of knowledge and skills achieved by students will be 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:

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

2 Seminars and tutorials: participation in these sessions with a maximum score of 1 point, ie measured, 10% of the final grade)

To pass the course it is necessary that the score of subfield 1.i exceeds 40% of its maximum score and that of subfield 1.ii is at least 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

Basic

- Referencia b1: Oetiker, Tobias; Partl, Hubert; Hyna, Irene; Schlegl, Elisabeth. La introducción no-tan-corta a LATEX 2e. Documento libre, 2014.

  Referencia b2: Quarteroni, Alfio; Saleri, Fausto. Cálculo Cientifico con MATLAB y Octave. Springer, 2006

  Referencia b3: Mathworks, Documentación oficial de Matlab (inglés). https://www.mathworks.com/help/matlab/index.html

Additional

- Referència c1: Grätzer, George. Practical LaTeX. Springer, 2014

  Referència c2: Grätzer, George. More math into LaTeX. 5ª Edición, Springer, 2016.

  Referencia c3: Cordero, Alicia. Métodos numéricos con MATLAB, València: Ed. UPV, 2005

  Referencia c4: Gilat, Amos. Matlab. Una introducción con ejemplos prácticos. Barcelona, Ed. Reverté, 2ª Edición, 2006.

  Referencia c5: Karris, Steven T. Numerical analysis using matlab and excel, Orchard Pubblications, 3ª Edición, 2007.

  Referencia c6: Langtangen, Hans Petter; Linge, Svein. Programming for Computations - MATLAB/Octave. Springer, 2016