COURSE DATA

Data Subject	
Code	34162
Name	Numeric approximation
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	3	First term
1928 - D.D. in Physics-Mathematics	Double Degree Program Physics and Mathematics	3	Second term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	8 - Numerical methods	Obligatory
1928 - D.D. in Physics-Mathematics	3 - Tercer Curso (Obligatorio)	Obligatory

Coordination

Name	Department
ARANDIGA LLAUDES, FRANCESC	255 - Applied Mathematics
PASTOR MURCIA, VICENTE JAVIER	363 - Mathematics

SUMMARY

This course, which is located in the first quarter of the third year of the degree in Mathematics and the second quarter of the third year of the double degree in Physics and Mathematics, is compulsory and subsequently taught the subject of Numerical Methods for Linear Algebra, also belonging to the branch of Numerical Analysis.

The purpose of this course is to introduce students to the learning of concepts and basic algorithms results as regards numerical approximation and interpolation functions as well as some applications, such as numerical integration. Thus, it will familiarize students in different interpolation methods, polynomial or segmental, and least squares approximation, as well as estimating, where possible, the quality of such interpolations or approximations. These techniques help you design and describe basic rules of numerical

integration.

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, computer tools, I mathematical analysis, numerical methods for linear algebra and linear algebra 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.
- Possess and understand the mathematical knowledge.
- 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.

LEARNING OUTCOMES

• Basic methods for interpolation and approximation of functions

• Basic methods for the integration of functions

• Calculation errors

DESCRIPTION OF CONTENTS

1. Functional approximation

Review acquired concepts on the approximation of functions, including Taylor approximations, and the expression of approximation error.

Limitations in the practical application of this type of functional approach.

2. Interpolation of functions

Lagrange Interpolation: Formal study of the interpolation problem.
Lagrange interpolation. Bases of Lagrange and Newton form of the interpolating polynomial of Lagrange. Interpolation error. Practical limitations of the Lagrange interpolation.

Hermite interpolation: Existence of Hermite interpolating polynomial. Newton form of the interpolating polynomial. Interpolation error.
Segmental polynomial interpolation. Spline interpolation

3. Numerical integration

Basic rules of numerical integration. Simple and compound rules. Integration error. Integration unbounded intervals.

Orthogonal polynomials. Sequences of orthogonal polynomials.

Gaussian rules

4. Least squares approximation

Discrete least squares approximation

QR decomposition

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	37,50	100
Computer classroom practice	22,50	100
Other activities	7,50	100
Preparation of evaluation activities	25,00	0
Preparing lectures	30,00	0
Preparation of practical classes and problem	27,50	0
TOTAL	**150,00**	

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

i. Continuous assessment of the practical sessions and reporting, with code results and comments.

ii. Carrying out checks on the practical contec. (Up to 4 points, ie, 40% of the final grade).

Final evaluation, consisting of a theoretical exam rated up to 5 points, ie 50% of the final grade.

2. Seminars and tutorials: participacion in these sessions with a maximun score of 1 point, ie measured, 10% of the final grade.

To pass the course will needthe score of subfiels 1.i and 1.ii exceed 40% of the maximun score.

Corresponding to continuous assessment under paragraph 1.i and paragraph 2 shall be kept qualifications obtained in the two announcements of the academic year in which the are made, since its assessment would only be possible throughout the semester and never in the resit.

REFERENCES

Basic

- Referència b1: A. Aubanell, A. Benseny y A. Delshams. Eines Bàsiques de Càlcul Numèric. Manuals de la Universitat Autònoma de barcelona, 1991.
- Referència b2: F. Aràndiga y P. Mulet. Càlcul Numèric. Publicacions de la Universitat de València. 2008.
- Referència b3: S. Amat , F. Aràndiga, J.V. Arnau, R. Donat, P. Mulet i R. Peris. Aproximació Numèrica. Publicacions de la Universitat de València. 2002.
- Referència b4: F. Aràndiga, R. Donat y P. Mulet. Mètodes Numérics per a l'Àlgebra Lineal. Publicacions de la Universitat de València. 2000

Additional

- Referència c1: A. Cordero, J.L. Hueso, E. Martínez y J.R: Torregrosa. Problemas resueltos de Métodos Numéricos. Thomson. 2006.
- Referència c2: J.D. Fraires y R.L. Burden. Métodos Numéricos. Thomson. 2002.
- Referència c3: G. Dalhquist and A. Björck. Numerical Methods. Prentice Hall. 1974.
- Referència c4: E. Isaacson and H. Keller. Analysis of Numerical Methods. Jonh Willey and Sons. 1966