VNIVERSITAT DE VALÈNCIA

Course Guide
34163 Numeric calculus

COURSE DATA

Data Subject	
Code	34163
Name	Numeric calculus
Cycle	Grade
ECTS Credits	9.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Faculty of Mathematics	4	First term
1928 - D.D. in Physics-Mathematics	Double Degree Program Physics and Mathematics	5	First term

Subject-matter

Degree	Subject-matter	Character
1107 - Degree in Mathematics	8 - Numerical methods	Obligatory
1928 - D.D. in Physics-Mathematics	5 - Quinto Curso (Obligatorio)	Obligatory

Coordination

Name	Department
MARTI RAGA, MARIA CARMEN	363 - Mathematics

SUMMARY

This course, located in the first semester of the fourth year of the degree in Mathematics and fith year of the doble degree in Physcis and Mathematics, is compulsory and taught after studying the subjects of ordinary differential equations, partial differential equations and numerical approximation.

The purpose of this course is to introduce students to the main the concepts, results and basic algorithms of numerical differentiation, numerical methods for solving differential equations and basic numerical methods for partial differential equations.

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 basic knowledge required for this course has been taught in the following courses: computer science, computer tools, mathematical analysis I, numericial methods for linear àlgebra and numerical approximation.

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

- Knowing the theory and application of basic numerical approximation of functions.

- Knowing the theory and application of numerical methods to solve ordinary differential equations and partial differential equations.

- Knowing some basic techniques of numerical analysis and their translation to algorithms implemented on some computational language.- Knowing how to use some mathematical software tools to solve numerical problems.

DESCRIPTION OF CONTENTS

1. Numerical differentiation

. Basic rules.
. Optimal rules.

2. Numerical methods for ODE

3. Introduction to numerical methods for PDE

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	56,00	100
Computer classroom practice	34,00	100
Other activities	11,00	100
Development of group work	40,00	0
Preparation of evaluation activities	34,00	0
Preparing lectures	25,00	0
Preparation of practical classes and problem	25,00	0
TOTAL	**225,00**	

TEACHING METHODOLOGY

The course is structured in theory sessions, practical sessions (in the classroom, with computers) and tutorials and seminars.

On the theory sessions, the teacher will teach the main agenda items, using the classroom's computer if necessary to illustrate any particular point. Students must respect the time of preparation of the classes scheduled for their optimal profit. The practical classes and seminars are prepared so that students will check their level of knowledge by facing and solving relatively complex problems and analyzing the results. As it was said before, students must prepare such sessions to solve the problems proposed on the scheduled time.

EVALUATION

Students will be continuously evaluated throughout the course. Said evaluation will follow the following blocks:

1. Theory and practice evaluation: since the objectives of the course focus on learning the theory on numerical calculation as well as on programing the numerical techniques learnt, the evaluation of this part will be conducted in two stages:

i. Continuous evaluation of the practical sessions by sending in reports with code results and comments. Exams on the practical content could be also done. (Up to 4 points, i.e., 40% of the final grade).

ii. Final evaluation, consisting on a theoretical exam rated up to 5 points, i.e., 50% of the final grade.

2. Seminars and tutorials evaluation: attendance and active participation in these sessions will be rated with a maximum of 1 point, i.e., 10% of the final grade.

To pass the course it is required that the score of both subfields 1.i and 1.ii exceed the 40% of their maximum score.

The scores obtained for blocks 1.i and 2 will be valid only in the two examination calls of the academic year in which they are received. Its evaluation can only be done continuously during the term and never in the extraordinary examination call.

REFERENCES

Basic

- Referencia b1:J. D. Douglas y R. Burden, Métodos numéricos, 3ª edición, Thomson, 2004.
- Referencia b2:F. Aràndiga y P. Mulet. Càlcul Numèric, Publicacions de la Universitat de València, 2008.
- Referencia b3:G. Strang, Introduction to applied mathematics. Wellesley-Cambridge Press, Wellesley, MA, 1986.

Additional

- Referencia c1:R. J. LeVeque, Finite difference methods for ordinary and partial differential equations. Steady-state and time-dependent problems. SIAM, 2007.
- Referencia c2:A. Quarteroni, F. Saleri, P. Gervasio, Scientific computing with MATLAB and Octave. Third edition, Springer-Verlag, 2010.
- Referencia c3:C. W. Gear, Numerical initial value problems in ordinary differential equations. Prentice-Hall, Inc., 1971.
- Referencia c4:J. D. Lambert, Numerical methods for ordinary differential systems. The initial value problem. John Wiley & Sons, 1991.