Universidad Zaragoza

Academic Year/course: 2023/24

27007 - Numerical Analysis I

Syllabus Information

Academic year: 2023/24
Subject: 27007 - Numerical Analysis I
Faculty / School: 100 - Facultad de Ciencias
Degree: 453 - Degree in Mathematics
ECTS: 9.0
Year: 2
Semester: Annual
Subject type: Compulsory
Module:

1. General information

In this course the mathematical foundations of the most important algorithms to solve some mathematical problems are studied. In particular, numerical methods for solving linear equation systems, the obtention of eigenvalues and eigenvectors of a matrix and the resolution of non-linear systems are analyzed. The goal is for the student to know the mathematical theory that supports these algorithms, as well as their utility and the implementation techniques of the studied algorithms.

The approaches and objectives of this module are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda; the learning activities could contribute to some extent to the achievement of the goals 4 (quality education), 5 (gender equality), 8 (decent work and economic growth), and 10 (reducing inequality).

2. Learning results

- The knowledge of the basic techniques of numerical analysis, its application to problems of linear algebra and analysis and its translation into algorithms or constructive methods for solving those problems.
- The adquisition of criteria to assess and compare different methods according to the problems to be solved, their computational cost and the effect of the errors.
- The ability to evaluate the results obtained and the obtention of conclusions after a calculation process.
- The ability to solve linear systems of medium size numerically, compute in a practical way the eigenvalues of a matrix and solve approximately non-linear systems of equations.

3. Syllabus

1. Direct methods for the numerical solution of linear systems.
2. Iterative methods for the solution of linear systems.
3. Approximated computation of eigenvalues and eigenvectors.
4. Numerical methods for the solution of nonlinear systems.

4. Academic activities

Master classes: 60 hours.
Problem solving: 15 hours.
Computer classes: 15 hours.
Project: 40 hours.
Study: 90 hours.
Assessment tests: 5 hours.

5. Assessment system

- The final grade will be obtained from the grades of the exams (90%) and the completion of assignments throughout the course (10%).
- The assignments will consist of solving problems and theoretical-practical questions. Some evaluation activities will be carried out by means of oral presentations.
- The exams will consist of a first partial exam at the end of the first term and a final exam, both with theory-problem

content.

- Classroom work will be evaluated in the part of computer practices and a computer practices exam will be held at the end of each term.
- In order to pass the course, the theory-problem part and the computer practical part must be passed independently. The final grade of the course will be the one obtained in the theory-problem part. Passing the part of computer practices is a requirement to pass the course, but it will not contribute to the final grade.

The student is also entitled to take a comprehensive exam to pass the course.