

Academic Year: (2020 / 2021)

Review date: 25-07-2020

Department assigned to the subject: Department of Mathematics

Coordinating teacher: BAYONA REVILLA, VICTOR

Type: Electives ECTS Credits : 6.0

Year : 2 Semester : 1

STUDENTS ARE EXPECTED TO HAVE COMPLETED

Numerical Methods
 Partial Differential Equations

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

- Understanding of main numerical approximation methods for PDEs.
- Ability to analyze the main features of a numerical method: order, stability, convergence.
- Ability to implement numerical methods for the solution of PDEs.
- Have criteria to assess and compare different methods depending on the problems to be solved, the computational cost and the presence of errors.

DESCRIPTION OF CONTENTS: PROGRAMME

Finite differences for time dependent PDEs.
 Finite differences for elliptic problems
 Spectral methods
 Finite element methods

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology will include:

- * Master classes, where the knowledge that the students must acquire will be presented. To make easier the development of the class, the students will have written notes and also will have the basic texts of reference that will facilitate their subsequent work.
- * Resolution of exercises by the students, in which proposed problems are discussed and developed (by the professor and by the students). These classes allow to the students to acquire the necessary skills.
- * Additionally, 1.4 ECTS will be used for tutorial learning activities. These tutorial activities will be supervised and they will have theoretical and practical content.
 3.2 ECTS will be used for the personal study of the students, which will have access to computer rooms.

ASSESSMENT SYSTEM

Oral presentations and written theoretical and practical (with MATLAB) problem solving throughout the course (40%).
 Final Exam (60%).

% end-of-term-examination:	60
% of continuous assessment (assignments, laboratory, practicals...):	40

BASIC BIBLIOGRAPHY

- Alfio Quarteroni Numerical Models for Differential problems, Springer, 2012
- John Strikwerda Finite Difference Schemes and Partial Differential Equations, SIAM, 2004
- K. W. Morton, D. F. Mayers. Numerical solution of partial differential equations. An introduction, Cambridge University Press, 2005
- Randall LeVeque Finite Difference Methods for Ordinary and Partial Differential Equations: Steady-State and Time-dependent Problems, SIAM, 2008

- S.C.Brenner, L.R.Scott The mathematical theory of finite element methods, Texts in Applied Mathematics, 15. Springer, New York, 2008

- W. Hackbusch Elliptic Differential Equations: Theory and Numerical Treatment, Springer Series in Computational Mathematics, 18. Springer-Verlag, Berlin, 2010

ADDITIONAL BIBLIOGRAPHY

- A. Iserles A first course in the numerical analysis of differential equations, Cambridge Texts in Applied Mathematics. Cambridge University Press, 2009

- C. Canuto, M.Y. Hussaini, A. Quarteroni, T.A. Zang. Spectral methods. Fundamentals in single domains, Scientific Computation, Springer-Verlag, Berlin, 2006

- C. Johnson Numerical solution of partial differential equations by the finite element method, Cambridge University Press, Cambridge, 1987