UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Course guide
200153 - CN - Numerical Calculus

Last modified: 11/04/2024

Unit in charge: School of Mathematics and Statistics
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 7.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: SONIA FERNANDEZ MENDEZ

Others: Primer quadrimestre:
SONIA FERNANDEZ MENDEZ - M-A, M-B
ABEL GARGALLO PEIRO - M-A, M-B
ESTHER SALA LARDIES - M-A, M-B

PRIOR SKILLS

Numerical linear algebra
Differential and integral calculus

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CE-2. Solve problems in Mathematics, through basic calculation skills, taking in account tools availability and the constraints of time and resources.
2. CE-3. Have the knowledge of specific programming languages and software.
3. CE-4. Have the ability to use computational tools as an aid to mathematical processes.

Generical:
5. CB-1. Demonstrate knowledge and understanding in Mathematics that is founded upon and extends that typically associated with Bachelor's level, and that provides a basis for originality in developing and applying ideas, often within a research context.
6. CB-2. Know how to apply their mathematical knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader or multidisciplinary contexts related to Mathematics.
7. CB-3. Have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements.
8. CG-1. Show knowledge and proficiency in the use of mathematical language.
9. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
10. CG-3. Have the ability to define new mathematical objects in terms of others already know and ability to use these objects in different contexts.
11. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.
12. CG-6 Detect deficiencies in their own knowledge and pass them through critical reflection and choice of the best action to extend this knowledge.

Transversal:
4. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

TEACHING METHODOLOGY

(see Catalan version)

LEARNING OBJECTIVES OF THE SUBJECT

(see Catalan version)

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	24.00
Hours small group	30,0	16.00
Self study	112,5	60.00

Total learning time: 187.5 h

CONTENTS

Root finding

Description:
(see Catalan version)

Full-or-part-time: 10h
Theory classes: 6h
Practical classes: 4h

Systems of non-linear equations

Description:
(see Catalan version)

Full-or-part-time: 10h
Theory classes: 6h
Practical classes: 4h

Function approximation

Description:
(see Catalan version)

Full-or-part-time: 20h
Theory classes: 12h
Practical classes: 8h

Numerical integration

Description:
(see catalan version)

Full-or-part-time: 15h
Theory classes: 9h
Practical classes: 6h

Introduction to numerical methods for differential equations

Description:
(see catalan version)

Full-or-part-time: 20h
Theory classes: 12h
Practical classes: 8h

GRADING SYSTEM

(see Catalan version)

BIBLIOGRAPHY

Basic:
- Aubanell, A.; Benseny, A.; Delshams, A. Eines bàsiques de càlcul numèric : amb 87 problemes resolts. Universitat Autònoma de Barcelona, 1991. ISBN 847929230X.
- Stoer, J.; Bulirsch, R. Introduction to numerical analysis. 3rd ed. Springer-Verlag, 2002. ISBN 9781441930064.
- Quarteroni, A.; Saleri, F. Scientific computing with MATLAB and octave [on line]. 3rd ed. Heidelberg: Springer, 2010 [Consultation: 20/06/2023]. Available on: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-642-12430-3. ISBN 9786613569660.

Complementary:
- Isaacson, E.; Keller, H. B. Analysis of numerical methods. Dover, 1994.
- Press, W.H. [et al.]. Numerical recipes : the art of scientific computing. Cambridge University Press, 1986.