



Course guide

200151 - ALN - Numerical Linear Algebra

Last modified: 01/06/2023

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

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

Academic year: 2023 **ECTS Credits:** 7.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: JUAN RAMON PACHA ANDUJAR

Others: Segon quadrimestre:
JUAN RAMON PACHA ANDUJAR - M-A1, M-B2
ÓSCAR RODRÍGUEZ DEL RÍO - M-A1, M-A3, M-B2, M-B3

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:

4. 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.
5. 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.
6. 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.
7. CG-1. Show knowledge and proficiency in the use of mathematical language.
8. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
9. 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.
10. 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:

11. 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
Self study	105,0	56.00
Guided activities	7,5	4.00
Hours small group	30,0	16.00

Total learning time: 187.5 h

CONTENTS

Linear systems of equations: direct methods

Description:

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Full-or-part-time: 25h

Theory classes: 15h

Laboratory classes: 10h

Finite arithmetics and accuracy

Description:

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Full-or-part-time: 5h

Theory classes: 3h

Laboratory classes: 2h

Eigenvalues and singular values

Description:

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Full-or-part-time: 20h

Theory classes: 12h

Laboratory classes: 8h

Linear systems of equations: iterative methods

Description:

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Full-or-part-time: 20h

Theory classes: 12h

Laboratory classes: 8h



Introduction to the use of numerical methods and applications

Description:

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Full-or-part-time: 5h

Theory classes: 3h

Laboratory classes: 2h

GRADING SYSTEM

(see Catalan version)

BIBLIOGRAPHY

Basic:

- Golub, G.H.; Van Loan, C.F. Matrix computations. 4th ed. The Johns Hopkins University Press, 2013. ISBN 9781421407944.
- Quarteroni, A.; Saleri, F. Scientific computing with MATLAB and octave [on line]. 3rd ed. Springer-Verlag, 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.
- Trefethen, Lloyd N; Bau, David. Numerical linear algebra. Philadelphia: SIAM, 1997. ISBN 0898713617.

Complementary:

- Kincaid, D.; Cheney, W. Análisis numérico : las matemáticas del cálculo científico. Addison-Wesley Iberoamericana, 1994. ISBN 0201601303.
- Press, W.H. [et al.]. Numerical recipes: the art of scientific computing. 3rd ed. Cambridge: Cambridge university, 2007.