Linear Geometry

Academic Year: (2021 / 2022) **Review date: 31-01-2022**

Department assigned to the subject: Mathematics Department

Coordinating teacher: SANZ SERNA, JESUS MARIA

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Fundamentals of Algebra,
Linear Algebra,
Differential Calculus

DESCRIPTION OF CONTENTS: PROGRAMME

1. Least squares problems
2. Eigenvalues and eigenvectors: diagonalization of matrices and Schur's triangularization
3. The Jordan canonical form
4. Normal matrices and their spectral theorem
5. Positive definite matrices
6. Bilinear and quadratic forms
7. The singular value decomposition
8. Affine spaces and their applications
9. Affine transformations
10. Conic sections and quadric surfaces

LEARNING ACTIVITIES AND METHODOLOGY

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THEORETICAL-PRACTICAL CLASSES. [44 hours with 100% classroom instruction, 1.76 ECTS]
Knowledge and concepts students must acquire. Student receive course notes and will have basic reference texts to facilitate following the classes and carrying out follow up work. Students partake in exercises to resolve practical problems and participate in workshops and evaluation tests, all geared towards acquiring the necessary capabilities.

TUTORING SESSIONS. [4 hours of tutoring with 100% on-site attendance, 0.16 ECTS]
Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher.

STUDENT INDIVIDUAL WORK OR GROUP WORK [98 hours with 0 % on-site, 3.92 ECTS]

FINAL EXAM. [4 hours with 100% on site, 0.16 ECTS]
Global assessment of knowledge, skills and capacities acquired throughout the course.

METHODOLOGIES

THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject`s main concepts are developed, while providing material and bibliography to complement student learning.

PRACTICAL CLASS. Resolution of practical cases and problems, posed by the

teacher, and carried out individually or in a group.

TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with a teacher as tutor.

ASSESSMENT SYSTEM

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

EVALUATION SYSTEMS

SE1 - FINAL EXAM. [50 %]
Global assessment of knowledge, skills and capacities acquired throughout the course.

SE2 - CONTINUOUS EVALUATION. [50 %]
Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course. Six short tests (each 20-30 minutes long) will be held along the course to assess the student's progression. Continuous evaluation also allows students themselves to modify their learning strategies, in case it is necessary.

BASIC BIBLIOGRAPHY

- B. Noble, J.W. Daniel Applied Linear Algebra, Prentice-Hall Int., 1988

- C.D. Meyer Matrix Analysis and Applied Linear Algebra, SIAM, 2000

- D.C. Lay, S.R. Lay, J.J. McDonald Linear Algebra and its Applications, 5th edition, Pearson, 2016

- G. Strang Introduction to Linear Algebra, Wellesley-Cambridge Press, 2016

- O. Faugeras Three Dimensional Computer Vision, A Geometric Viewpoint, The MIT Press, 1993

- S.R. García and R.A. Horn A Second Course in Linear Algebra, Cambridge University Press, 2017

ADDITIONAL BIBLIOGRAPHY

- E. Outerelo Domínguez y J.M. Sánchez Abril Nociones de Geometría Proyectiva, Sanz y Torres, 2009

- P. Lancaster and M. Tismenetsky The Theory of Matrices with Applications, 2nd edition, Academic Press, Inc., 1985

- R.A. Horn and C.R. Johnson Matrix Analysis, 2nd edition, Cambridge University Press, 2013