

Course guide

320092 - AL - Algebra

Last modified: 27/09/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: AITANA MEDINA LEÓN

Others: AITANA MEDINA LEÓN
LIDIA RUEDA TRIVIÑO

PRIOR SKILLS

Contents of math matters of high school, specially linear equations systems and matricial operations.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE01-ESAUD. Ability to solve mathematical problems that may arise in engineering. Aptitude to apply knowledge of linear algebra, geometry, differential and integral calculus, differential and partial differential equations, numerical methods, numerical algorithms, statistics, and optimization. (Basic training module)

Transversal:

CT06 N1. Self-directed learning - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

Basic:

CB1. That students have demonstrated possession and understanding of knowledge in a field of study that is based on general secondary education, and is typically found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

TEACHING METHODOLOGY

- Sessions of exposure and work of the contents.
- Sessions of exercises resolution and practical work.
- Autonomous work of study and realization of exercises.
- Preparation and realization of evaluable activities individually and/or in group.
- Exercises resolution manually and computer aided

LEARNING OBJECTIVES OF THE SUBJECT

To know and to understand the concepts and results of linear algebra and Boolean algebra of the course program.
Application of basic methods of analytical calculation and computer tools to solve exercises and problems.
To know some cases of use of the course contents to model engineering problems.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours medium group	30,0	20.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

Binary Boolean Algebra

Description:

2.

Specific objectives:

- Understand the general structure of Boolean algebra and the specific structure of binary Boolean algebra.
- Use the properties of Boolean functions to modify their expression, construct the corresponding value table and calculate the min-max canonical forms.
- Use the Karnaugh map method to simplify Boolean expressions.
- Understand the functions of different logic gates.

Related activities:

Full-or-part-time: 25h

Theory classes: 5h

Practical classes: 5h

Self study : 15h

Set theory and propositional logic

Description:

1. Sets and propositions. Axioms and properties
2. Set operations. Venn diagrams
3. Connectors. Truth tables

Specific objectives:

- Use the language of propositional logic to describe mathematical problems.
- Perform set operations and simplify them using Venn diagrams and algebraic laws.
- Use propositional truth tables.
- Recognise the common structure of set algebra and propositional algebra.

Related activities:

Full-or-part-time: 20h

Theory classes: 4h

Practical classes: 4h

Self study : 12h

Complex numbers

Description:

3.

Full-or-part-time: 20h

Theory classes: 4h

Practical classes: 4h

Self study : 12h

Vector sapces

Description:

1. The concept of space and subspace. Generated space.
2. Linear independence. Bases and dimension.
3. Change of basis.
4. Dot product. Orthogonal projection.

Specific objectives:

- Understand the specific concepts and techniques applicable to vector spaces, in particular R^n spaces: vector subspaces, set of generators of a subspace, linear dependence and independence, bases.
- Understand the change of basis technique.

Related activities:

Full-or-part-time: 45h

Theory classes: 9h

Practical classes: 9h

Self study : 27h

Linear transformations and diagonalization. Diagonalisation

Description:

1. Concept and properties
2. Matrix characterisation
3. Eigenvalues and eigenvectors. Diagonalisation.

Specific objectives:

- Understand the concept of linear transformation and its matrix representation.
- Calculate the eigenvalues and eigenvectors of a matrix, and understand the diagonalisation technique.

Related activities:

Full-or-part-time: 40h

Theory classes: 8h

Practical classes: 8h

Self study : 24h

GRADING SYSTEM

- Exam of 1st evaluation: 25%
- Tasks of 1st evaluation: 15%
- Exam of 2nd evaluation: 45%
- Tasks of 2nd evaluation: 15%

Re-avaluació:

- Cal haver-se presentat als dos exàmens de l'assignatura a la convocatòria actual.

I cal nota global inferior a 5 i nota mitjana ponderada de proves presencials escrites (controls, exàmens parcials i finals) igual o superior a 3.5.

- La nota de l'examen de reavaluació substituirà la d'aquestes proves escrites presencials i es mantindran les altres.

- Si la nota ponderada després de reavaluació és igual o superior a 5, la nota final serà 5. Si la ponderada és inferior a 5 substituirà la inicial només si és superior.

BIBLIOGRAPHY

Basic:

- Arvesú, J.; Marcellán, F.; Sánchez, J. Problemas resueltos de álgebra lineal. Madrid: Paraninfo, 2015. ISBN 9788428335263.
- Anton, H. Introducción al álgebra lineal. Limusa, 2003.
- Grimaldi, R. Matemáticas discreta y combinatoria: una introducción con aplicaciones. Addison-Wesley Iberoamericana, 1997.
- Lipschutz, Seymour. Álgebra lineal. 2ª ed. Madrid: McGraw-Hill, 1992.

Complementary:

- Grossman, Stanley I.; Flores Godoy, J. Álgebra lineal [on line]. 8a ed. México D. F. [etc.]: McGraw-Hill, 2019 [Consultation: 10/06/2022]. Available on : <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5808932>. ISBN 1456271857.
- Johnsonbaugh, R. Matemáticas discretas [on line]. Prentice Hall, 2005 [Consultation: 20/09/2022]. Available on : https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4677.
- Veerarajan, T. Matemáticas discretas con teoría de gráficas y combinatoria. McGraw-Hill, 2008.
- Hernández Rodríguez, E.; Vázquez Gallo, M. J.; Zurro Moro, M. A. Álgebra lineal y geometría [on line]. 3a ed. Madrid: Pearson, 2012 [Consultation: 10/06/2022]. Available on : https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1210. ISBN 9788478291298.
- Rojo, Jesús; Martín, Isabel. Ejercicios y problemas de álgebra lineal. Madrid: McGraw-Hill, 1994.

RESOURCES

Other resources:

Theory presentations
Lists of exercises
Scripts for practices with the computer software
Atenea questionnaires