UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course:	ALGEBRA	**Code:**	56300
Type:	BASIC	**ECTS credits:**	6
Degree:	351 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (ALM)	**Academic year:**	2023-24
Center:	106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING	**Group(s):**	56
Year:	1	**Duration:**	First semester
Main language:	Spanish	**Second language:**	
Use of additional languages:		**English Friendly:**	N
Web site:		**Bilingual:**	N

Lecturer: **DOROTEO VERASTEGUI RAYO** - Group(s): **56**

Building/Office	Department	Phone number	Email	Office hours
Elhuyar / Matemáticas	MATEMÁTICAS	926052122	doroteo.verastegui@uclm.es	

2. Pre-Requisites

Students will have to master the contents taught in the subject of Mathematics in the Bachelor's Degree in Science and Technology.

In particular, they must have achieved:

1. Basic knowledge of geometry, trigonometry, mathematical operations (powers, logarithms, fractions), polynomials, matrices, derivation, integration and graphical representation of functions.

2. Basic instrument handling skills: Basic computer handling (operating system).

Those students who have studied another modality should acquire, during the first weeks of the semester, a sufficient knowledge of the basic mathematical techniques. In this regard, it would be advisable to attend the so-called "Zero Courses" that the Centre will organise during the first four-month period.

3. Justification in the curriculum, relation to other subjects and to the profession

The Industrial Engineer is the professional who uses the knowledge of physical and mathematical sciences and engineering techniques to develop his professional activity in aspects such as control, instrumentation and automation of processes and equipment, as well as the design, construction, operation and maintenance of industrial products. This training allows it to successfully participate in the different fields that make up industrial engineering, such as mechanics, electricity, electronics, etc., to adapt to the changes in technologies in these areas and, where appropriate, to generate them, thus responding to the needs that arise in the productive and service sectors in order to achieve the well-being of the society to which they belong.

Within the mathematical knowledge necessary to develop the above, the methods developed in the Algebra subject have proven to be the most appropriate for the modern treatment of many disciplines included in the Curriculum. Disciplines that, in the end, will allow the engineer to face the problems that will arise during the course of his career.

Therefore, it is necessary to take this course because it is an essential part of the basic training of a future engineer. Its purpose is to provide students with the basic algebraic resources necessary to follow up on other specific subjects of their degree, so that the student has sufficient algebraic ability and dexterity to solve problems related to engineering and mathematics. In addition, this subject helps to enhance the capacity for abstraction, rigour, analysis and synthesis that are characteristic of mathematics and necessary for any other scientific discipline or branch of engineering.

4. Degree competences achieved in this course

Course competences

Code	Description
A01	To understand and have knowledge in an area of study that moves on from the general education attained at secondary level and usually found at a level that, while supported in advanced text books, also includes some aspects that include knowledge found at the cutting edge of the field of study.
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A03	To have the capability to gather and interpret relevant data (normally within the area of study) to make judgements that include a reflection on themes of a social, scientific or ethical nature.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
A17	Ability to apply principles and methods of quality control.
B01	Ability to solve mathematical problems that occur in engineering. Aptitude to apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics and optimization.
CG03	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
CG04	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Mechanical Engineering.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know the theory of matrices and determinants and to know how to carry out the corresponding calculations. Know the fundamentals and applications of Lineal Algebra and Euclidean Geometry

Be able to express yourself correctly both orally and in writing, and, in particular, to know how to use mathematical language to express with precision quantities and operations that appear in industrial engineering. Become accustomed to working in a team and behaving respectfully.

To know how to use and carry out elementary operations with complex numbers.

6. Units / Contents

Unit 1: Complex numbers

Unit 2: Matrices and determinants

Unit 3: Linear Equation Systems

Unit 4: Vector Spaces

Unit 5: Linear applications

Unit 6: Diagonalization of endomorphisms

Unit 7: Euclidean vector space. Geometry

Unit 8:

Unit 9:

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	A01 A02 A03 A07 A08 A17 B01 CG03 CG04	1.2	30	N	-	Development of theoretical content in the classroom, using the participatory master lesson method
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A01 A02 A03 A07 A08 A17 B01 CG03 CG04	0.6	15	Y	N	Exercise and problem solving in the classroom.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	A01 A02 A03 A07 A08 A17 B01 CG03 CG04	0.4	10	Y	N	Laboratory practices in the computer classroom with the use and application of specific software
Study and Exam Preparation [OFF-SITE]	Self-study	A01 A02 A03 A07 A08 A17 B01 CG03 CG04	2.76	69	N	-	Personal study of the subject and resolution of exercises and problems outside the classroom that will be given to the teacher and that the teacher will evaluate.
Study and Exam Preparation [OFF-SITE]	Self-study	A01 A02 A03 A07 A08 A17 B01 CG03 CG04	0.84	21	Y	N	
Formative Assessment [ON-SITE]	Assessment tests	A01 A02 A03 A08 A17 B01 CG03 CG04	0.2	5	Y	Y	Final evaluation of the course by written test
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of activities done in the computer labs	10.00%	10.00%	Finally, a written test will be taken, consisting of questions, theoretical questions and problems whose evaluation criteria will be similar to those of the academic papers described above.
Progress Tests	20.00%	0.00%	Academic work carried out by students in (10%) and out (10%) of class, some of which are tutored by the teacher individually or in small groups, for whose evaluation a report should be submitted in which the approach to the problem, the use of appropriate terminology and notation to express the ideas and mathematical relations used, the choice of the most appropriate procedure for each situation, the justification of the different steps of the procedure used, the results obtained and the cleanliness and presentation of the document will be assessed. Practices in the computer room (10%), with the application of specific software, where the delivery of the work done in them will be evaluated, and the student will have to defend himself orally, individually, with the teacher.
Final test	70.00%	90.00%	
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

In order to obtain the final mark, the two evaluation systems described above are computed, with the specified weights, and a grade of 4 out of 10 or higher must be obtained in the final written test. If the mark obtained in this test is less than 4 points, it will be given as the final mark of the course.

Non-continuous evaluation:

Evaluation criteria not defined

Specifications for the resit/retake exam:

In order to obtain the final mark, the marks obtained in the first evaluation system described above will be kept and a new written Final Exam will be taken, calculating the final mark of the course combining the 2 marks as specified above. Likewise, in the final written test, a grade equal to or higher than 4 points out of 10 must be obtained. If the mark obtained in this test is less than 4 points, this will be the final grade of the course. If the 2 evaluation systems are calculated as described in the previous paragraph, and the final mark is lower than the mark obtained in the written Final Examination, the mark obtained in the Final Examination will be recorded as the final mark of the subject.

Specifications for the second resit / retake exam:

A final written test will be taken, weighing 100 % of the overall mark of the subject and consisting of questions, theoretical questions and problems where the approach to the subject or problem will be assessed, the use of appropriate terminology and notation to express the ideas and mathematical relations used, the choice of the most appropriate procedure for each situation, the justification of the different steps of the procedure used, the results obtained and the cleaning and presentation of the document.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	69
Study and Exam Preparation [AUTÓNOMA][Self-study]	21
Formative Assessment [PRESENCIAL][Assessment tests]	5

Global activity

Activities	**hours**
Study and Exam Preparation [AUTÓNOMA][Self-study]	21
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	69
Formative Assessment [PRESENCIAL][Assessment tests]	5
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
Burgos Román, Juan de	Fundamentos matemáticos de la ingeniería : (álgebra y cálculo) : definiciones, teoremas y resultados	García Maroto	Madrid	978-84-936299-2-2	2008	
Burgos Román, Juan de	Fundamentos matemáticos de la ingeniería : (álgebra y cálculo) : 162 problemas útiles	García Maroto	Madrid	978-84-936712-3-5	2009	
Beitia Bengoa, María Blanca	Fundamentos matemáticos de la ingeniería. II, Algebra lineal : resumen teórico y problemas	Servicio Editorial de la Universidad del País Vasco	Vitoria	84-8373-479-6	2002	
Lay, David	Álgebra lineal y sus aplicaciones	Pearson Educación	México	978-607-32-1398-1	2012	
Dionisio Pérez Esteban	Álgebra lineal enfocada a la ingeniería	Garceta		978-84-1622-864-5	2016	
David C. Lay	Álgebra lineal y sus aplicaciones	Pearson Educación		978-607-32-1398-1	2012	
Gutiérrez Gómez, Andrés	Geometría	Pirámide		84-368-0236-5	1983	
Belmonte Beitia, J.	Problemas resueltos de Álgebra Lineal con aplicaciones	Lulú			2020	
Hernández, E	Álgebra lineal y Geometría	Addison-Wesley			1994	
Aranda, E.	Algebra Lineal con aplicaciones y Python	Lulú			2019	
Strang, G.	Álgebra lineal y sus aplicaciones	Cengage Learning Editores SA			2006	
Larson, Ron	Fundamentos de álgebra lineal	Cengage Learning		978-607-481-019-6607	2010	