UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: ALGEBRA
Code: 19500
Type: BASIC
ECTS credits: 6
Degree: 384 - MINING AND ENERGY ENGINEERING DEGREE
Academic year: 2023-24
Center: 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING
Group(s): 51
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): **51**

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
B01	Capacity to solve mathematical problems which might arise in the engineering field. Attitude to apply knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, differential equations and in partial derivatives; numerical methods, numeric algorithms, statistics and optimization.
C03	To know basic numerical calculus applied to the engineering field.
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CT00	To promote respect and promotion of Human Rights as well as global access principles and design for everybody according to the 10th final order of the Law 51/2003 of December 2nd¿ about equal opportunities, non-discrimination and universal accessibility for people with disabilities.
CT02	To be acquainted with Information and Communication Technology ICT
CT03	Capacity for written and oral communication skills.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know how to use and carry out basic calculations with complex numbers.

Capacity to express yourself correctly both in spoken and in written form , and particuarly, to know how to use mathematical language as well as to know how to express precisely quantities and operations which are present in the Mining engineering field

To know matrix theory and to know how to carry out the corresponding calculations.

Additional outcomes

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:

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	B01 C03 CB01 CB02 CB03 CB05 CT00	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	B01 C03 CB01 CB02 CB03 CB05 CT00 CT02 CT03	0.6	15	Y	N	Exercise and problem solving in the classroom.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	B01 C03 CB01 CB02 CB03 CB05 CT00 CT02 CT03	0.4	10	Y	Y	Laboratory practices in the computer classroom with the use and application of specific software
Study and Exam Preparation [OFF-SITE]	Self-study	B01 C03 CB01 CB02 CB03 CB05 CT02 CT03	3.6	90	Y	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.
Formative Assessment [ON-SITE]	Assessment tests	B01 C03 CB01 CB02 CB03 CB05 CT00 CT03	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.
Final test	70.00%	90.00%	
Progress Tests	20.00%	0.00%	
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]	90
Formative Assessment [PRESENCIAL][Assessment tests]	5

Global activity

Activities	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]	90
Formative Assessment [PRESENCIAL][Assessment tests]	5
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Aranda, E.	Algebra Lineal con aplicaciones y Python	Lulú			2019	
Larson, Ron	Fundamentos de álgebra lineal	Cengage Learning		978-607-481-019-6607	2010	
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	
Strang, G.	Álgebra lineal y sus aplicaciones	Cengage Learning Editores SA			2006	
Hernández, E	Álgebra lineal y Geometría	Addison-Wesley			1994	
Belmonte Beitia, J.	Problemas resueltos de Álgebra Lineal con aplicaciones	Lulú			2020	