

Course Unit	Mathematics I		Field of study	Mathematics	
Bachelor in	Management		School	School of Technology and Management	
Academic Year	2023/2024	Year of study	1	Level	1-1
Type	Semestral	Semester	1	ECTS credits	6.0
Code	9147-707-1103-00-23				
Workload (hours)	162	Contact hours	T	-	TP
			60	PL	-
			TC	-	S
			E	-	OT
			O	-	

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Carla Sofia Veiga Fernandes, Florbela Alexandra Pires Fernandes, João Carlos Sampaio Maldonado Costa Mendes

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Perform arithmetic operations and use them to characterize the graphs of some elementary real functions of a real variable.
2. Decompose an elementary function into simplest elementary functions; understand the concepts of injectivity, surjectivity, bijectivity and inverse function.
3. Understand the concept of derivative and being able to deduce and use the rules of differentiation of elementary functions; solve optimization problems formalized by real functions of a real variable.
4. Relate the operations of integration and differentiation; compute primitives of elementary real functions of a real variable, using techniques of integration by parts and by substitution.
5. Know the rules of matrix algebra; solve systems of linear equations by the methods of Gauss and Gauss-Jordan; classify systems of linear equations with respect to the types of solutions.
6. Compute the inverse of a matrix using Gaussian elimination method.
7. Compute determinants using the method of Laplace and Gaussian elimination method.
8. Compute inverse matrices via the adjoint matrix; solve systems of linear equations by Cramer's rule.

Prerequisites

Before the course unit the learner is expected to be able to:

1. Solve arithmetic operations.
2. Solve linear and quadratic equations and inequalities.
3. Add, subtract, multiply and divide polynomial expressions.
4. Identify both algebraically and geometrically, linear, exponential and logarithmic functions.

Course contents

Linear algebra. Real functions of a real variable.

Course contents (extended version)

1. Linear algebra.
 - Addition, multiplication and transposition of matrices.
 - Classification of square matrices.
 - Matricial form of a system of linear equations
 - Resolution of systems of linear equations by the methods of Gauss and Gauss-Jordan.
 - Computing the inverse matrix by Gauss method.
 - Computing determinants via Laplace and Gauss methods.
 - Properties of determinants; computing the inverse matrix using determinants.
 - Resolution of systems of linear equations by Cramer's rule.
2. Real functions of a real variable.
 - Defining real function of a real variable; domain, codomain, range, graphic.
 - Decomposition of an elementary function in simplest elementary functions.
 - Sequences of real numbers; limits; limit of a function; properties of limits.
 - Continuity of a function at a point and on an interval.
 - Higher order derivatives. Theorems on differentiable functions.
 - Higher order derivatives. Theorems on differentiable functions.
 - Unconstrained optimization problems.
 - Primitives of elementary functions; primitivation by substitution and by parts.

Recommended reading

1. Carreira, A. & Pinto, G. (1999). Cálculo Matricial. Volume 1. Lisboa: Instituto Piaget.
2. N. Piskounov, N. (1993). Cálculo Diferencial e Integral. Volume I. Lopes da Silva Editora.
3. Lima, E. L. (2017). Curso de Análise (14ª ed.). Volume 1. Rio de Janeiro: Projecto Euclides.

Teaching and learning methods

The topics of the course unit will be introduced and explored during the lessons - resolution of exercises will complement the theoretical concepts. Outside the classes, the students must solve practical exercises and, whenever they consider useful, they should use computer and/or calculator.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
 - Intermediate Written Test - 35% (First partial test assesses the acquired skills in Chapter 1 and is held during classes.)
 - Intermediate Written Test - 65% (Second partial test assesses the acquired skills in Chapter 3 and is held at the final exam's day.)
2. Alternative 2 - (Regular, Student Worker) (Supplementary)
 - Intermediate Written Test - 100% (Reproved student can repeat 1 or 2 of the partial tests referred on the Alternative 1.)
3. Alternative 3 - (Regular, Student Worker) (Supplementary, Special)
 - Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation		
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