Course Unit	Mathematics I		Field of study	Mathematics	
Bachelor in	Industrial Management and Engineering		School	School of Technology and Management	
Academic Year	2022/2023	Year of study	1	Level	1-1
				ECTS credits	6.0
Type	Semestral	Semester	1	Code	9104-754-1105-00-22

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)	Maria Fátima Moreira da Silva Pacheco

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Have sensitivity to use a rigorous notation in mathematics communication (oral and written).
2. Solve linear equations systems. Calculate eigenvalues and eigenvectors of square matrices. Calculate the inverse of a square matrix.
3. Know the types of real functions of real variable. Determine the domain and the domain of a function. Study limits and continuity of functions and make their graphical representation.
4. Derive functions and apply the derivatives to determine the ends of a function.
5. Apply the fundamental theorem of calculus. Identify and apply integration techniques. Apply the integral in the calculation of areas and volumes.

Prerequisites

Before the course unit the learner is expected to be able to:
Have skills to apply the mathematical concepts taught during high school.

Course contents

Matrices and determinants applied to the solution of linear systems and eigenvalues computation. Derivative and integrals of real functions. Integration of real function and its application to the computation of areas and volumes.

Course contents (extended version)

1. Matrices.
   - Brief notions of vector calculus. Types of matrices. Elementary row/column operations.
   - Determinants of matrices of different orders. Calculation rules and properties.
   - Inverse of a matrix and techniques for its calculation.
   - Calculation of eigenvalues and eigenvectors of square matrices and their properties.
2. Systems of linear algebraic equations.
   - Resolution methods Gauss and Gauss-Jordan, Cramer's rule and method of the inverse matrix.
3. Real valued functions.
   - Description and properties of algebraic functions and transcendent functions.
   - Derivation techniques, intermediate value theorems, study of functions and optimization problems.
   - Rules and techniques of primitivation, definite integral and its applications.

Recommended reading

1. Anton, H. , & Rorres, C. (2014). Elementary Linear Algebra - Applications version (11th ed.). Wiley.
2. Kolman, B. (1998). Introdução à Álgebra Linear com Aplicações. Prentice-Hall do Brasil.
3. Goldstein, L. , Lay, D. , & Schneider, D. (1981). Cálculo e suas Aplicações. Hemus.
4. Stewart, J. (2013). Cálculo (Volume 1, 7ª ed.). São Paulo: Thomson Learning.
5. Swokowski, E. W. (1984). Cálculo com Geometria Analítica (Volume 1). McGraw-Hill.

Teaching and learning methods

The themes will be presented and discussed throughout the classes, using the resolution of tasks to deepen them. There will be individual and group sessions outside class schedule to accompany the student's work. The use of software will be encouraged.

Assessment methods

1. Distributed evaluation - (Regular, Student Worker) (Final, Supplementary)
   - Practical Work - 20%
   - Intermediate Written Test - 40% (Test about the contents of chapters 1 and 2.)
   - Intermediate Written Test - 40% (Test about the contents of chapter 3.)
2. Final exam - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Maria Fátima Moreira da Silva Pacheco	Carla Sofia Veiga Fernandes	António Jorge da Silva Trindade Duarte	Paulo Alexandre Vara Alves
30-09-2022	30-09-2022	11-10-2022	05-11-2022