INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Mathematics I			Field of study	Mathematics		
Bachelor in	Renewable Energy Engineering			School	School of Technology and Management		
Academic Year	2023/2024	Year of study	1	Level	1-1	ECTS credits	6.0
Type	Semestral	Semester	1	Code	9910-743-1104-00-23		

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): Paula Maria Pereira de Barros

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 applied to 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%
   - Final Written Exam - 40%
2. Distributed evaluation - (Regular, Student Worker) (Final, Supplementary)
   - Intermediate Written Test - 50%
   - Final Written Exam - 50%
3. Final exam - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100% (The written exam may be complemented with an oral test to defend the grade.)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Paula Maria Pereira de Barros	Florbela Alexandra Pires Fernandes	Ana Maria Alves Queiroz da Silva	José Carlos Rufino Amaro
11-10-2023	16-10-2023	29-10-2023	31-10-2023