INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Calculus I			Field of study	Mathematical and Quantitative Methods								
Bachelor in	Informatics and Communications			School	School of Public Management, Communication and Tourism								
Academic Year	2023/2024	Year of study	1	Level	1-1	ECTS credits	6.0						
Type	Semestral	Semester	2	Code	9188-320-1202-00-23								
Workload (hours)	162	Contact hours	T -	TP 60	PL -	TC -	S -	E -	OT 20	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): Monica Penarroias Branco Carneiro

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Read, write and use mathematical language fluidity.
2. Solve easily problems envolving mathematical expressions.
3. Recognize the meaning of formulas and be able to use them to solve problems.
4. Use functions to modelling and solving problems.

Prerequisites

Before the course unit the learner is expected to be able to:
use basic knowledge of mathematics.

Course contents

Study and representation of real functions. Function limits. Continuity. Derivatives. Applications of the derivative. Solve problem using derivative.

Course contents (extended version)

1. Real functions of a real variable
   - Formula and graph of a function.
   - Characteristics of functions: zeros, sinal and domain.
   - Polinomial functions: affine, quadratic and polynomial with degree greater than 2.
   - The algebra of fuctions. Division algorithm and Ruffini's rule.
   - Monotonicity. Relative extrema for a function.
   - Rational and irracional functions. Domain and range.
   - Piecewise function. Absolute value function.
   - Injectivity. Inverse function. Identity function. Composition of functions.
2. Limit of a function
   - Heine's limit definition. One sided limits. Limit properties.
   - Indeterminate forms of limits.
   - Asymptote of functions.
3. Continuity of a function
   - Continuity of a function at a point, on a set.
   - Local properties of continuous functions.
4. Exponential and Logaritmic Functions
   - Exponential function: definition, graph and properties. Exponential equations and inequalities
   - Logarithm function: definition, graph and properties. Logarithmic equations and inequalities.
5. Differentiation
   - Interpretations of the derivative. Differentiation formulas.
   - Derivative function. Derivative and continuity.
   - Applications of the derivatives.
   - Sketch graphs.

Recommended reading

1. Hoffman, L. and Bradley, G. (2016). Calculus for Business, Economics and the Social and Life Sciences. (11. ª Ed.) USA: Editora McGraw-Hill Companies, 2016. [ISBN: 9780073532387]
2. Piskounov, N. (1977). Cálculo Diferencial e Integral, Volume 1. Lopes da Silva, Editora, Portugal. [ISBN: 97204942]
3. Tan, S. (2010). Applied Mathematics for the Managerial, Life and Social Sciences. (5th Ed.) Brooks/Cole [ISBN: 9780495559672]
4. Harshbarger, R. and Reynolds, J. (2006). Matemática Aplicada: administração, economia e ciências sociais e biológicas. (7ª Ed.) São Paulo Editora McGraw-Hill Companies [ISBN: 9788586804847]
5. Stewart, J. (2008). Calculus: Early Transcendentals. (6th Ed.) USA: Thomson Brooks/Cole [ISBN: 9780495011668]

Teaching and learning methods

The lessons are structuralized with the following components:
- written exposition and verbal communication of the program contents;
- illustrations with examples and counterexample;
- resolutions of problems;

Assessment methods

1. Final evaluation - (Regular, Student Worker) (Final)
   - Intermediate Written Test - 50%
   - Final Written Exam - 50%
2. Final evaluation - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 100% (All course contents)

Language of instruction

Portuguese

Electronic validation

Monica Penarroias Branco Carneiro	Elisabete da Anunciacao Paulo Morais	Anabela Neves Alves de Pinho	Luisa Margarida Barata Lopes
06-03-2024	06-03-2024	06-03-2024	12-03-2024