INSTITUTO POLITÉCNICO DE BRAGANÇA

Course Unit	Mathematical Analysis			Field of study	Mathematics		
Bachelor in	Management Informatics			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	9186-709-1103-00-22		

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): Pedro Miguel Rodrigues de Oliveira

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Analyse graphically the properties of a real function of a real variable.
2. Determine and interpret geometrically first and second order derivatives.
3. Calculate limits involving indeterminate forms.
4. Apply the derivatives to the study of the graph of a function.
5. Interpret and model problems and determine their optimum values.
6. Identify and apply basic integration formulas for any real functions.
7. Understand the geometrical meaning of definite integral and apply the fundamental theorem of calculus.
8. Identify improper integrals and analyse their convergence.

Prerequisites

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

Course contents

Functions of a real variable; Differentiation; Integration.

Course contents (extended version)

1. Functions of real variable.
   - Elementary functions.
   - The algebra of functions. Composition of functions. Inverse function.
   - Exponential and logarithm functions.
   - Direct and inverse elementary trigonometric functions.
   - Limits: definition, properties and indeterminate forms.
   - Continuity: definition and properties of continuous functions.
2. Differentiation.
   - The concept of derivative. Properties of the derivative.
   - Derivation rules.
   - Higher order derivatives.
   - Fundamental theorems about differentiation.
   - Applications of derivatives to the study of function properties.
   - One variable optimization problems.
3. Integration.
   - The indefinite integral: definition and properties; integration formulas.
   - The definite integral: definition and properties; The fundamental theorem of calculus.
   - The mean value of a function.
   - Applications of definite integrals: Finding áreas of plane surfaces; Finding volumes of revolutions.
   - Improper integrals. Definition and properties.

Recommended reading

1. Swokowski, E. W. , "Cálculo com Geometria Analítica", Vol. 1, 2, McGraw-Hill, 1979.
2. Hoffmann, L. and Bradley, G. , "Applied Calculus for Business, Economics, and the Social and Life Sciences", McGraw-Hill, 2012.
3. Ron Larson, Bruce H. Edwards, “Cálculo com Aplicações”, LTC Editora, 2005.
4. Larry Goldstein, David Lay e David Schneider, “Cálculo e suas Aplicações”, Hemus, 1981.
5. J. Stewart, “Cálculo” (vol. 1). CENGAGE Learning, São Paulo - Brasil, 2010

Teaching and learning methods

Most of the syllabus contents will be introduced in the classroom, in the theoretical-practical classes. The deepening of the contents will be developed in face-to-face sessions for resolving exercises and in non-face-to-face time in which subjects will be approached with application exercises. At the teacher's timetable, the student can ask questions and monitor his / her study.

Assessment methods

1. Normal assessment - (Regular, Student Worker) (Final)
   - Practical Work - 50% (Application exercises solved individually during non-classroom hours.)
   - Final Written Exam - 50%
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

Pedro Miguel Rodrigues de Oliveira	Carla Sofia Veiga Fernandes	José Carlos Rufino Amaro	Paulo Alexandre Vara Alves
28-09-2022	30-09-2022	30-09-2022	07-11-2022