Course Unit	Mathematics II			Field of study	Mathematics		
Bachelor in	Management			School	School of Technology and Management		
Academic Year	2021/2022	Year of study	1	Level	1-1	ECTS credits	6.0
Type	Semestral	Semester	2	Code	9147-707-1205-00-21		

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, 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. Compute definite integrals and improper integrals of elementary functions.
2. Apply integral calculus to determine areas of plane regions, volumes of solids of revolution and the average value of a function on an interval.
3. Analyze real functions of two real variables and use them to formalize and solve optimization problems.
4. Solve some types of first order differential equations: separable equations, exact equations and linear equations.
5. Analyze numerical series with respect to convergence.
6. Represent functions by power series. Relate the concepts of numerical series and power series.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Analyze elementary functions.
2. Compute derivatives and primitives of elementary functions.

Course contents

Integral calculus. Real functions of several variables. Introduction to ordinary differential equations. Infinite series and power series.

Course contents (extended version)

1. Integral calculus.
   - Fundamental theorem of integral calculus and properties of definite integrals.
   - Improper integrals.
   - Applications of definite integral and improper integral: mean value, areas and volumes.
2. Real functions of several real variables.
   - Domain, codomain and graph of functions with several variables.
   - Continuity of real functions of two real variables
   - Partial derivatives and its graphical interpretation. Higher order partial derivatives.
   - Chain rule and implicit differentiation.
   - Extrema of a real function with several variables. Optimization problems.
3. Introduction to ordinary differential equations.
   - Particular solution and general solution of a differential equation.
   - Initial value problems: existence theorems and uniqueness of a particular solution.
   - Techniques for solving separable equations, exact equations and first order linear equations.
4. Numerical series and power series.
   - Definition and properties of numerical series.
   - Criteria of convergence of series with positive terms; absolute convergence.
   - Taylor polynomial; power series; convergence interval.
   - Representation of functions by power series.

Recommended reading

1. Anton, H. , Bivens, I. Davis, S. (2007). Cálculo (volume I). Porto Alegre: Bookman.
2. Sowokowski, E. W. (1994). Cálculo com geometria analítica. São Paulo: Makron Books.
3. Anton, H. , Bives, I & Davis, S. (2007). Cálculo (vol. I). Bookman.
4. Stewart, J. (2006). Cálculo (Vol. I e Vol II). São Paulo: Thomson Learning.
5. Ferreira, M. f. (1995). Equações Diferenciais Ordinárias. Lisboa: McGraw-Hill.

Teaching and learning methods

The contents will be introduced in the classroom. Outside the classroom, the topics will be explored autonomously by studying the theoretical subjects and solving suggested exercises and tasks.

The students will be challenged to watch selected videos(in the MathE and Coursera platforms) about the topics to be studied in the following class, following a «flipped classroom» inspired approach.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
   - Intermediate Written Test - 60% (First partial test assesses the acquired skills in Chapters 1 and 2 and is held during classes.)
   - Intermediate Written Test - 40% (Third partial test assesses the acquired skills in Chapters 3 and 4 and is held on Final Exam day.)
2. Alternative 2 - (Regular, Student Worker) (Supplementary)
   - Intermediate Written Test - 100% (Reproved student can repeat 1 of the partial tests refered on the Alternartive 2.)
3. Alternative 3 - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100%

Language of instruction

Portuguese

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Electronic validation

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03-03-2022	04-03-2022	11-03-2022	19-03-2022

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