POLI ESCOLA SUPERIOR TECNOLOGIA GESTÃO TÉCNICO GUARDA	**SUBJECT DESCRIPTION**	**MODELO** PED.013.03

Course	**Energy and Environment**					
Subject	**Mathematical Analysis**					
Academic year	2022/2023	*Curricular year*	1st	*Study period*	1st semester	
Type of subject	Compulsory	*Student workload (H)*	Total: 168	Contact: 90	*ECTS*	6
Professor(s)	César Gonçalves					
☒ *Area/Group Coordinator* ☐ *Head of Department* *(select)*	Graça Tomaz					

PLANNED SUBJECT DESCRIPTION

1. LEARNING OBJECTIVES

It aims that the student acquires knowledge and skills in terms of theoretical foundations and techniques for calculating the level of the syllabus provided. It is also intended that students develop reasoning, comprehension, and interpretation, as well as the ability to apply the acquired knowledge to solve specific problems related to the purview of the respective course.

2. PROGRAMME

1- Real Functions of Real Variable.

1.1- Definition and basic concepts.

1.2- One-to-one functions; onto functions; monotone functions; limited functions; even and odd functions; periodic functions.

1.3- Composite function and inverse function.

1.4- Study of elementary functions: exponential function; logarithmic function; circular trigonometric functions and their inverses.

1.5- Limits, definition and fundamental theorems. Lateral limits. Fundamental theorems on limits. Generalization of a limit notion. Indeterminations.

1.6- Continuity, definition and properties. Bolzano-Cauchy and Weirstrass theorems.

2- Differential Calculus on IR.

2.1- Notion of derivative and geometric interpretation. Lateral Derivative. Derivation rules. Derivative of composite function and inverse function. Tangent straight equation and normal straight equation to the graph of a function.

2.2- Rolle, Lagrange and Cauchy theorems. Cauchy rule for limits calculation.

2.3- Derivatives of order n. Taylor's formula with Lagrange rest and Peano rest. McLaurin formula.

2.4- Extremes and monotony. Inflection points and direction of concavity of the graph of a function. Complete study of functions.

3- Primitives.

3.1- Primitive notion. Immediate primitives. General methods of primitivation.

3.1.2- Primitivation by parts.

3.1.3- Primitivation by substitution.

3.4- Primitivation of powers of trigonometric functions.

3.5- Primitivation of reducible fractions to rational fractions.

4- Integral Calculus in IR.

4.1- Riemann integral and fundamental properties. Fundamental Theorem of Integral Calculus.

4.2- Integration by parts and by substitution.

4.3- Applications of integral calculus to the calculation of areas.

4.4- improper integrals of 1st species 2nd species and mixed.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

The programmatic contents are set in accordance with the UC objectives, with a view to the development of calculus and mathematical thinking as support, and thus allowing students to foster the skills of logical reasoning and abstraction, in a controlled manner, demanding and effective, and its application in other Curricular Units, as well as future employment within the area of Energy and Environment.

4. MAIN BIBLIOGRAPHY

Required:

- Apostol, T. M. (1985). Calculus, vol. II., Jonh Wiley & Sons, New York.
- Azenha, A. (2000). Elementos de Cálculo Diferencial em **R** e $\mathbf{R}^n$, McGraw-Hill.
- Ferreira, J. Campos (2005). Introdução à Análise Matemática. Fundação Calouste Gulbenkian.

- Gonçalves, C. R. (2021), Análise Matemática I – Resumo teórico, exercícios ilustrativos e exercícios propostos, IPG.
- Gonçalves, C.R. (2022), Caderno de Exercícios, material didático elaborado no âmbito da UC de Análise Matemática, ESTG-IPG.
- Silva, J C (1994). Princípios de Análise Matemática Aplicada, McGRAW-HILL, Lisboa.

Suggested:

5. Guidorizzi, H. L. (2001). Um Curso de Cálculo Vol I.
6. Lima, E. L.(1999). Curso de Análise Vol 1. Rio de Janeiro: Projeto Euclides.
7. Piskounov, N (1986). Cálculo Diferencial e Integral, vol. I e Vol II., Lopes da Silva Editora, Porto.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

The methodologies will meet established objectives for UC, with expository and interactive lessons, intercalated with discussion and resolution of problems and practical exercises. The students are encouraged to problem solving and individual research autonomously, involved in their learning and debugging.

Continuous evaluation: Threewritten tests with a minimum of 4 values in each test and final classification (arithmetic average) greater than or equal to 10, to permit exemption from examination and/or approval.

Evaluation by final exam: Normal season and resource season, with final classification greater than or equal to 10, to approval.

Oral test compulsory for classifications above 16 points. Tests will be without consultation and interdiction calculator and mobile phones.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

In the presentation of the concepts and results focus is objectivity, consistency and sequential logic, and fomented intuitive understanding of the concepts and the ability to calculate, using clear examples to develop scientific reasoning and mathematical ability and opening the application of concepts mathematicians. With this kind of methodology seeks to develop a solid foundation of training for the student to learn to apply and integrate the knowledge in new situations, in broad contexts and multidisciplinary.

7. ATTENDANCE

Not applicable.

8. CONTACTS AND OFFICE HOURS

Professor: César Gonçalves, crg@ipg.pt, Ext.1207, Gab. 7, Office Hours: Mondays 14:30 – 17:00
Tuesdays 14:30 – 16:03

Area Coordinator: Graça Tomaz, gtomaz@ipg.pt, Ext.1233, Gab. 33

DATE

September 19, 2022
Clique

SIGNATURES

Professor

(signature)

Area/Group Coordinator

(signature)