SUBJECT DESCRIPTION

POLI
ESCOLA SUPERIOR
TECNOLOGIA
GESTÃO
TÉCNICO
GUARDA

MODELO

PED.013.03

Course	**Mechanics and Industrial Informatics**					
Subject	**Applied Mathematics I**					
Academic year	2023-2024	*Curricular year*	1st	*Study period*	1st semester	
Type of subject	Compulsory	*Student workload (H)*	Total: 175,5	Contact: 90	*ECTS*	6,5
Professor(s)	Graça Tomaz					
☒ *Area/Group Coordinator* ☐ *Head of Department*	Graça Tomaz					

PLANNED SUBJECT DESCRIPTION

1. **LEARNING OBJECTIVES**

   Provide students with basic knowledge of Differential Calculus, Integral Calculus and matrix calculus becoming thus equipped with a conceptual theoretical framework and calculus skills needed to the understanding and development of mathematical applications within the scope of the course.

2. **PROGRAMME**

   1. Real-valued functions of a real variable

      1.1. Definition and examples; composite function; inverse function.

      1.2. Elementary functions: polynomial, rational, irrational, exponential, logarithmic, trigonometric and their inverses, hyperbolic.

   2. Differential calculus

      2.1. Limits

      2.2. Continuous functions

      2.3. Derivative function

      2.4. Indeterminate form

      2.5. Partial derivative and gradient vector

         2.5.1. Basics of functions of several variables

         2.5.2. Limits

         2.5.3. Notion of partial derivative and gradient

   3. Integral calculus

      3.1. Indefinite integral of real functions

         3.1.1. Immediate indefinite integrals. Integration methods.

         3.1.2. Integration of rational functions.

      3.2. Riemann integral

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3.2.1. Definition, examples, and properties.

3.2.2. Fundamental theorem of the integral calculus.

3.2.3. Integration by parts and substitution.

3.2.4. Application of the definite integrals to find areas.

4. Linear algebra

4.1. Matrices: classification, operations, rank, and inverse. Application to solve linear systems of equations.

4.2. Determinants: definition, properties, Laplace Theorem, adjoint matrix, and inverse matrix. Application to solve linear systems.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

The programme is designed to provide the basic contentes in the áreas of Mathematical Analysis and Linear Algebra so that students have the essential tools to solve concrete problems.

4. MAIN BIBLIOGRAPHY
Compulsory

1. Herman, E. & Strang, G. (2016). Calculus, vol. 1, OpenStax. (Disponível online em: https://openstax.org/details/books/calculus-volume-1)

2. Kolman, B. & Hill, D. R. (2013). Álgebra Linear com Aplicações, Editora LTC, Rio de Janeiro.

3. Pires, G. E. (2014). Cálculo Diferencial e Integral em IR^n, 2ª edição, IST Press, Lisboa.

4. Santana, A. P., Queiró, J. F.(2010). Introdução à Álgebra Linear. Gradiva, Lisboa..

5. Stewart, J. (2017). Cálculo , Vol I , Tradução da 8ª edição norte-americana, Cengage Learning.

Recommended

1. Ferreira, J. C. (1995). Introdução à Análise Matemática, Fundação Calouste Gulbenkian, Lisboa.

2. Strang. G.(2009). Introduction to Linear Algebra. Wellesley-Cambridge Press.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)
Methodology: The teaching methodologies include lectures and interactive classes: theoretical classes with the resolution and discussion of exercises and problems addressing the issues in a practical and objective way to engage students in their learning process.

Continuous Assessment: Two written tests (P1, P2) during the semester. Students are approved if their average grade is equal to or greater than 9.5 points out of 20.

Exam (normal season): The students who were unsuccessful in continuous evaluation can take one test covering the entire syllabus. They are approved if the obtained grade is not less than 9.5 points out of 20.

If students took tests P1 and P2 and were not approved through continuous assessment, but they have obtained a grade greater than or equal to 9.5 points in one of them, they can choose to take only the test in which they obtained the grade lower than to 9.5 points in order to achieve a minimum CF of 9.5 points.

Exam (recourse season): Every student duly enrolled in the course who has not been approved in previous seasons may, during the recourse season, take an exam covering all the content taught. They will be considered approved if they obtain a score equal to or greater than 9.5 points out of 20.

In any of the evaluation seasons, no student may receive a score higher than 16 points without taking an additional oral examination.

All tests/exams will be closed-book, with the use of calculators and mobile phones prohibited.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES
The expository method is used to present the theoretical concepts fundamental to the understanding of the syllabus. The interactive method is consistent with the objectives as the professor solves some exercises by asking students' participation and promoting the exchange of ideas among all students. Problem solving is also in line with the objectives of the curricular unit as it is the application of the theoretical contents to the practical problems that allow students to consolidate the subject matter that has been taught.

7. ATTENDANCE
Not applicable.

8. CONTACTS AND OFFICE HOURS
Professor and Area Coordinator: Graça Tomaz; gtomaz@ipg.pt ; Office 33

Office hours: Tuesday 15:00-17:00

9. OTHERS
Not applicable.

DATE
18 September 2023

SIGNATURES

Professor

_____
(signature)

Area/Group Coordinator

_____
(signature)