CALCULUS

Degree in Computer Systems

Degree in Computer Systems

Degree in Electrical and Computer Engineering

Code: 10209

Main Scientific Area: Mathematics and Physics

Lecturer: Natália Maria de Bessa Pacheco Rego

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 100h

ECTS: 6,0

Objectives

The aim of the course is to provide students with the mathematical and numerical calculations that support the specific subjects of the course.

Learning Outcomes

The student should be able to:
a) analyse functions;
b) recognize the shape of a set of specific functions;
c) perform operations of differential and integral calculus;
d) use numerical methods when algebraic calculation is not possible.

Course Contents

Chapter 1 Limits and Continuity of functions
1 Real functions of variable real
2 Limits of real functions of variable real
2.1 Concept of limit. General properties
2.2 One Sided Limits
2.3 Limits on infinity and infinite limits (Indeterminate)
2.4 Asymptotic Study
3. Continuity
3.1 Continuous Functions. General properties
3.2 Fundamental Theorems of Continuity
4. Asymptotic Study
4.1 Vertical Asymptotes
4.2 Horizontal Asymptotes
4.3 Obliquel Asymptotes
Chapter 2 Trigonometric and Trigonometric Inverse Functions
1. Arc Sine
2. Arc-Cosine
3. Arc-Tangent
4. Arc-Cotangent
Chapter 3 Differentiability
1 Definition and properties

2 Fundamental Theorems of Differentiability
3 Study of Functions
Chapter 4 Nonlinear Equations
1. Roots of functions
2. Roots separation
2.1 Graphic method
2.2 Rolle Numbers
3. Iterative methods
3.1 Bisection method
3.2 False Position method
3.3 Fixed point iteration
3.4 Newton-Raphson method
3.5 Comparison between methods
Chapter 5 Interpolation and Polynomial Approximation
1. Polynomial Interpolation
2. Calculation of polynomial interpolation
2.1 Lagrange Method
2.2 Newton Method
3. Interpolation errors
4. Comparison between the methods
5. Choose the degree of the polynomial interpolator
Chapter 6 Integration.
1. Riemman Integration. Sufficient Conditions of Integrability
2. Properties of Riemann Integral
3. Indefinite Integral/Antiderivate
4. Integration by Parts
5. Integration by Substitution
6. Areas
Chapter 7. Numerical Integration
1. Numerical Integration
2. Newton-Cotes Integration
2.1 Trapeziodal Rule
2.2 Simpson's 1/3 Rule
2.3 Simpson's 3/8 Rule
3. Error of Newton-Cotes Integration
Chapter 8 - Laplace Transform
1. Definition of Laplace Transform.
2. Properties and theorems of Laplace Transform.

Recommended Bibliography

Ferreira, J.C. (2011). Introdução à Análise Matemática, Fundação Calouste Gulbenkian.
Rodrigues, J.A. (2003). Métodos Numéricos-Introdução aplicação e Programação (11ªedição). Sílabo.
Valença, M.R. (1993). Métodos Numéricos. Livraria Minho.
Valença, M.R. (1996). Análise Numérica. Universidade Aberta.

Learning and Teaching Methods

The understanding, manipulation and application of the concepts of differentiability and integrability of real valued functions provide some essential mathematical knowledge required for the proper functioning of other units of the course curriculum. They also allow to develop the scientific reasoning and the mathematical ability to the

application of the mathematical concepts.

Assessment Methods

Students on the degree courses inComputer Systems Engineering Electrical and Computer Engineeringwill be assessed by:

- Two tests (T1 and T2), one in the middle of the semester and the other at the end of the semester (85%)
The second test has a minimum score of 7 values.
- One class question (Q) (15%)
- Final Mark (NF) will be given by:
NF = 42,5%T1+42,5%T2+15%Q

Evaluation Exam
NF = NE
Where NE is exam grade

Assessment for calculus in the degree courses in degree inMedical Informatics Engineering-change in evaluation because the course belongs to Concept 50+10

Continuous Assessment

Students will be assessed by:

- Two face-to-face tests (T1 and T2), one in the middle and one at the end of the semester (85%)

The 2nd test has a minimum score of 7 points

-Project developed in the context of the Concept 50 + 10 (P) (15%)

- The final mark (FN) is given by:

NF = 42,5%T1+42,5%T2+15%P

The 50/10 Project is compulsory and has a minimum mark of 9,5 points.

Assessment by Exame

NF = 0,85NE + 0,15P

Where NE is the exam grade.