



UNIVERSIDADE LUSÍADA
LISBOA

Course Unit Program
Complements of Mathematical Analysis

Academic Year 2026/2027

1. Organic Unit

Faculty of Business and Economic Sciences

2. Course

Computer Engineering

3. Cycle

1st

4. Course Unit

Complements of Mathematical Analysis (L9011)

5. Scientific Area

6. Curricular Year

2nd

7. Type of Curricular Unit / Semester

1st Semester



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8. Class type and workload (work time)

Theoretical classes:

Practical classes:

Theoretical-Practical Classes 30,00

Tutorial Guidance: 20,00

9. ECTS Credits

6,00

10. Scientific Area Coordinator

11. Regent

Prof. Doutor JOSÉ GUSTAVO ELIAS REBELO

12. Assistants

13. Teaching Language

Portuguese

14. General Objectives

To provide students with essential mathematical tools for studying various disciplines in the area of Computer Engineering.

To develop analytical and operational skills in fundamental topics of applied mathematics.

15. Specific Objectives

Familiarize students with essential introductory concepts of complex analysis, multiple integrals, and ordinary differential equations.

Prepare them to apply these tools to modeling and solving concrete problems in the area of computer engineering and computational science.

16. Skills to be acquired

To develop the ability to represent and manipulate numbers and functions in the complex plane.

To differentiate and integrate functions of a complex variable.

To compute double and triple integrals in different coordinate systems.

To solve first- and second-order ordinary differential equations.

To apply mathematical techniques to the modeling and solving of problems in science and engineering.

17. Teaching Methodology



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The teaching is structured in theoretical-practical classes with presentation of the program content, resolution of examples and application of techniques.

Tutorial guidance sessions are held for practical exercises with active participation of the students.

The Moodle platform will be used to support learning with notes, cards and other materials.

18. Course Unit Program

1. Introduction to Complex Analysis

1.1 Algebraic and topological structure of the set of complex numbers

1.2 Definition of complex functions of a complex variable

1.3 Derivation of complex functions of a complex variable Cauchy-Riemann conditions

2. Multiple integrals

2.1. Double integral. Definition and properties. Fubini' Theorem. Double integrals in non-rectangular domains. Change of variables. Polar coordinates. The integral as a measure.

2.2. Triple integrals. Definition and properties. Fubini' Theorem. Change of variables. Cylindric and spherical coordinates. Applications.

3. Ordinary differential equations

3.1. Motivation: radioactivity decay.

3.2. First order equations. Linear equations. Separable equations. Exact equations. Applications. Existence and unicity theorem.

3.3. Second order linear equations. Existence and unicity theorem. General solution of the homogeneous equation with constant coefficients. Solution of the non-homogeneous equation. Applications.

19. Assessment Methods

- Exercises to be solved by students during OT classes.
- Problem sheets.
- Final individual written test

Continuous assessment will follow the General Regulations for Knowledge Assessment in force and the Course Unit's Continuous Assessment Plan, integrating two mandatory components: a final individual written exam and a continuous individual oral assessment process.

20. Didactic Resources

- Notes and exercise sheets available on Moodle
- Recommended bibliography: Main and complementary

21. Sustainability Objectives

SDG 4 ? Quality Education ? Develop skills in logical reasoning, inductive and deductive reasoning. Modeling and problem solving.

SDG 8 ? Decent Work and Economic Growth ? Improve employability through mathematical skills and analytical skills.

SDG 9 ? Industry, Innovation and Infrastructure ? Apply mathematics to innovation and technological development.



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22. Keywords

Introduction to the study of complex variables

Multiple integrals

Ordinary differential equations



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23. Main Bibliography

Author(s): Carlos Sarrico
Title: Cálculo diferencial e integral para funções de várias variáveis-Leituras e exercícios
Edition: 1^a Year: 2009
Local: Lisboa
Publisher: Esfera do Caos
ISBN Code:

Author(s): Miguel Ramos
Title: Curso elementar de equações diferenciais
Edition: 1^o Year: 2000
Local: Textos de Matemática da FCUL
Publisher: Departamento de Matemática da FCUL
ISBN Code:

Author(s): Adelaide Carreira e Maria Suzana Nápoles
Title: Variável Complexa
Edition: 1^o Year: 2016
Local: Lisboa
Publisher: DM.FCUL
ISBN Code:

24. Complementary Bibliography

Author(s): Tom M. Apostol
Title: Calculus, Vols I e II
Edition: 2^a Year: 1975
Local: USA
Publisher: Wiley
ISBN Code:

Author(s): J. Stewart
Title: Calculus
Edition: 7^a Year: 2012
Local: Belmont, CA, USA
Publisher: Brooks / Cole



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