



UNIVERSIDADE LUSÍADA
LISBOA

Course Unit Program
Complements of Mathematical Analysis

Academic Year 2024/2025

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. Doutora MARIA ADELAIDE DUARTE CARREIRA LEITE VIDEIRA

12. Assistants

13. Teaching Language

Portuguese

14. General Objectives

To introduce and to complete mathematical tools essentials in Engineering.

15. Specific Objectives

To introduce students in the study of complex analysis, ordinary differential equations, numerical and power series and its most relevant applications.

16. Skills to be acquired

The students must learn:

- Algebra and topology of the set of complex numbers
- Definition and derivation of complex functions of a complex variable;
- To solve the most common ordinary differential equations
- To compute the sum of some numerical series and to apply the most common convergence criteria
- To represent functions in power series
- To apply those tools to solve real engineering problems

17. Teaching Methodology

The course is organised in 2 weekly theoretical/practical sessions, supported by a weekly tutorial session. The fundamental concepts will be enlightened by examples.



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18. Course Unit Program

Introdução à Análise Complexa

1.1 Algebraic and topological structure of the set of complex numbers

1.2. Definition and derivation of complex functions of a complex variable: Cauchy-Riemann conditions; Taylor's theorem

2. Ordinary differential equations

2.1. Motivation: radioactivity decay.

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

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

3. Series

3.1. Motivation: infinite decimal.

3.2. Numerical series. Definition and properties. Reducible series. Geometric series. Applications. Nonnegative series and convergence criteria. Simple and absolute convergence.

3.3. Power series. Convergence Interval. Power series representation of functions. Taylor series. Applications.

19. Assessment Methods

Two middle term tests during the semester.

20. Didactic Resources

- Course notes (Moodle)
- Bibliography
- Exercices (Moodle)

21. Sustainability Objectives

Fundamental knowledge in Analysis, relevant for engineers.

22. Keywords

Complex functions of Complex variable

Ordinary differential equations

Numerical series

Power series



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23. Main Bibliography

Author(s): Adelaide Carreira e Susana Nápoles
Title: Variável Complexa
Edition: 1^a Year: 2016
Local: Lisboa
Publisher: DM.FCUL

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

Author(s): Ana Sá e Bento Louro
Title: Sucessões e séries: teoria e prática
Edition: 1^o Year: 2009
Local: Lisboa
Publisher: Escolar Editora

24. Complementary Bibliography

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

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



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Ficha técnica MIP / MIP Datasheet	
Título / Title	Course Unit Program 'COMPLEMENTOS DE ANÁLISE MATEMÁTICA': Academic Year 2024/2025
Autor / Author	Prof. Doutora MARIA ADELAIDE DUARTE CARREIRA LEITE VIDEIRA
Classificação / Classification	-
Descritores / Descriptors	-
Colaborador(es) / Colaborator(s)	-
Data Hora / Date Time	
Formato de dados / Data Format	Texto / Text, PDF
Estatuto de utilização / Usage	Acesso público / Public Access
Relação / Relation	Version 3,0
(c) Universidade Lusíada, 2025	