UNIVERSIDADE LUSÍADA
LISBOA

Course Unit Program
Electrical and Electronic Circuits

Academic Year 2025/2026

1. Organic Unit

Faculty of Business and Economic Sciences

2. Course

Computer Engineering

3. Cycle

1st

4. Course Unit

Electrical and Electronic Circuits (L9024)

5. Scientific Area

6. Curricular Year

3rd

7. Type of Curricular Unit / Semester

2nd 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

Prof. Doutor RUI GABRIEL ARAÚJO DE AZEVEDO SILVA

11. Regent

Prof. Doutor RAUL EDUARDO CAPELA TELLO RATO

12. Assistants

13. Teaching Language

Portuguese

14. General Objectives

-Develop the ability to solve problems in the analysis and synthesis of simple, passive and active circuits.
-Interface of circuits with digital systems.
-Experimental verification of the main concepts learned.

15. Specific Objectives

Students who successfully complete this curricular unit will be able to:
1. Understand and solve basic electrical circuits by applying Ohm and Kirchhoff's laws, mesh and knot analysis techniques, voltage and current dividers.
2. Use Thévenin and Norton's theorems, and calculate quantities of interest, such as voltage, current or power in the different parts and components of the circuit.
3. Design basic circuits that meet specifications, choosing the correct components (resistances, c

16. Skills to be acquired

1. Identify and apply Ohm's and Kirchhoff's laws in circuit analysis.
2. Analyze circuits using nodal and mesh methods, including voltage and current dividers.
3. Use Thévenin's and Norton's theorems for simplification and calculation of quantities.
4. Design basic circuits that meet specifications by selecting appropriate components.
5. Simulate and validate circuits with SPICE and MATLAB, linking them to laboratory work.

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17. Teaching Methodology

Exposition of concepts followed by practical examples and problem solving.

Laboratory: Circuit assembly to consolidate theoretical concepts.

Computer simulations: Use of tools such as VERILOG, SPICE and MATLAB.

Group projects: Development of collaborative projects to apply concepts.

18. Course Unit Program

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1.Introduction to Electrical Circuits

Basic concepts: Electric charge, current, voltage, power and energy.
Passive components: Resistors, capacitors, inductors.
Voltage and current sources (ideal and real).
Analysis of simple circuits: Series, parallel and mixed resistive circuits.

2. Fundamental Laws of the Circuits

Ohm's Law: Relationship between current, voltage, resistance and power.
Kirchhoff's Laws: Kirchhoff's Current Law (LCK) and Kirchhoff's Voltage Law (LTK).
Voltage and current division: Analysis of voltage and current dividers.

3. Circuit Analysis Methods

Nodal analysis: Technique for determining voltages at nodes.
Mesh analysis: Method for calculating currents in closed loops.
Superposition: Application of the superposition principle in circuits with multiple sources.
Thévenin and Norton theorems: Simplification of complex circuits for load analysis.

4. Transient Response in Circuits

RC and RL circuits: Analysis of first-order circuits in transient regime.
Natural and forced response.
RLC circuits: Response of second order circuits.
Response time and time constant.

5. Introduction to digital circuits

Digital signals and voltage levels.
Principles of Transistor-Transistor Logic (TTL).
Study of digital gates in TTL.

6. Simulation, Computational Tools and Practical Projects

Introduction to VERILOG, SPICE and MATLAB: Circuit simulation and results analysis.
Modeling, assembly and measurement of circuits.
Use of breadboards.

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19. Assessment Methods

The continuous assessment methodology is expressed in the General Regulation for Continuous Assessment in force, it consists of a minimum of 2 tests/projects.

20. Didactic Resources

slides
PDFs with support material

21. Sustainability Objectives

SDG 4- Quality Education: promotes scientific literacy and the ability to solve problems in circuits, essential for basic engineering training.
SDG 5- Gender Equality: encourages inclusive participation in laboratory activities and project work, reducing asymmetries in access and academic success.
SDG 9- Industry, Innovation and Infrastructure: develops skills to design, simulate and validate electronic solutions that support efficient and reliable digital infrastructures.

22. Keywords

Electronic Circuits
Microelectronics
Simulation

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23. Main Bibliography

Author(s): Adel S. Sedra e Kenneth C. Smith
Title: Microeletrónica: Circuitos e Dispositivos
Edition: 5 Year: 2007
Local:
Publisher: PEARSON EDUCATION
ISBN Code: 978-8576050223

Author(s): Shirshendu Roy
Title: Advanced Digital System Design: A Practical Guide to Verilog Based FPGA and ASIC Implementation
Edition: 1 Year: 2024
Local:
Publisher: Springer
ISBN Code: 978-3031410840

Author(s): Charles K. Alexander e Matthew N. O. Sadiku
Title: Fundamentos de Circuitos Elétricos
Edition: 5 Year: 2013
Local:
Publisher: McGraw Hill
ISBN Code: 978-8580551723

24. Complementary Bibliography

Author(s): James W. Nilsson e Susan Riedel
Title: Electric Circuits, Global Edition
Edition: 11 Year: 2019
Local:
Publisher: Springer
ISBN Code: 978-1292261041

Author(s): James W. Nilsson e Susan A. Riedel
Title: Circuitos Elétricos
Edition: 1 Year: 2003
Local:
Publisher: LTC - Livros Tecnicos e Cientificos Editora
ISBN Code: 978-8521613633

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Autor / Author	Prof. Doutor RUI GABRIEL ARAÚJO DE AZEVEDO SILVA
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