Course guide
230383 - ACEND - Alternative Computing Strategies with Emerging Nanoelectronic Devices

Last modified: 11/06/2025

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).
MASTER'S DEGREE IN ELECTRONIC ENGINEERING (Syllabus 2022). (Optional subject).

Academic year: 2025 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: ANTONIO CALOMARDE PALOMINO

Others: Primer quadrimestre:
ANTONIO CALOMARDE PALOMINO - 11
JOSE ANTONIO RUBIO SOLA - 11

PRIOR SKILLS

Basis of digital circuits. Digital circuits. Basics of conventional computers.

TEACHING METHODOLOGY

Theory lectures, research works, lab experiments

LEARNING OBJECTIVES OF THE SUBJECT

Alternative computing techniques: Introduction to memristive circuits, concept of Memristor. Models of memristors. Application: Memories, Computing, Computer In Memory, Neuromorphic circuits.

STUDY LOAD

Type	Hours	Percentage
Hours large group	16,0	21.33
Hours small group	8,0	10.67
Self study	51,0	68.00

Total learning time: 75 h

CONTENTS

Memristive Devices, Circuits, and Systems

Description:
Classes of Memory Resistors
Theory of Memristors
Nonlinear Dynamics of Memristors
Application of Memristorscontent english

Specific objectives:
Introduction to memristive circuits

Related activities:
Class

Full-or-part-time: 10h
Theory classes: 10h

Signal Processing Paradigms Enabled by Disruptive Memristive Nanotechnologies

Description:
Neuromorphic Computing
Crosspoint Crossbar Computing
Neural Network Computing
Quantum Computing

Specific objectives:
New circuits paradigms

Related activities:
Class

Full-or-part-time: 10h
Theory classes: 10h

Laboratory

Description:
Laboratory

Specific objectives:
Experiments and simulation with Memristors

Related activities:
Lab

Full-or-part-time: 4h
Laboratory classes: 4h

GRADING SYSTEM

Final exam 50%
Continuous evaluation 50%

EXAMINATION RULES.

Written/Oral/lab

BIBLIOGRAPHY

Basic:
- Vourkas, Ioannis ; Sirakoulis, Georgios Ch. Memristor-Based Nanoelectronic Computing Circuits and Architectures [on line]. Cham: Springer, 2016 [Consultation: 01/06/2022]. Available on: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-319-22647-7. ISBN 9783319226477.
- Adamatzky, A. ; Chua, L. Memristor networks [on line]. Cham: Springer International Publishing, 2014 [Consultation: 16/06/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=1636480. ISBN 9783319026305.
- Vourkas, I.; Escudero, M.; Sirakoulis, G. C.; Rubio, A. "Chapter 13 - Ubiquitous memristors on-chip in multi-level memory, in-memory computing, data converters, clock generation and signal transmission". Dimitrakis, P.; Valov, I.; Tappertzhofen, S. Metal oxides for non-volatile memory: materials, technology and applications [on line]. Amsterdam, Netherlands: Elsevier, 2022. pp. 445-463 [Consultation: 04/11/2022]. Available on: https://sciencedirect.com/book/9780128197660.

RESOURCES

Audiovisual material:
- Slides of the professor. Slides of the professor

Computer material:
- Simulator, memristor models. Simulator, memristor models