



**ΕΛΛΗΝΙΚΟ ΜΕΣΟΓΕΙΑΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ**  
**ΠΟΛΥΤΕΧΝΙΚΗ ΣΧΟΛΗ**  
**ΤΜΗΜΑ ΗΛΕΚΤΡΟΛΟΓΩΝ ΜΗΧΑΝΙΚΩΝ ΚΑΙ ΜΗΧΑΝΙΚΩΝ ΥΠΟΛΟΓΙΣΤΩΝ**

**ΠΡΟΣΚΛΗΣΗ ΣΕ ΔΗΜΟΣΙΑ ΠΑΡΟΥΣΙΑΣΗ**  
**ΔΙΔΑΚΤΟΡΙΚΗΣ ΔΙΑΤΡΙΒΗΣ**

Την **24/04/2026** και **ώρα 13:00** θα γίνει η δημόσια παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής του υποψήφιου διδάκτορα του Τμήματος Ηλεκτρολόγων Μηχανικών και Μηχανικών Υπολογιστών κ. **Μιχαήλ Λοΐζου** με τίτλο : **“Development and Optimization of Printable Perovskite and Polymer-Based Memristive Optoelectronic Devices Using Two-Dimensional Materials”**.

Η παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής θα πραγματοποιηθεί στην **ΣΤΕΦ 0.90 (νέα ΣΤΕΦ Ισόγειο)** του κτιρίου **K.20** του Τμήματος Ηλεκτρολόγων Μηχανικών και Μηχανικών Υπολογιστών και **διαδικτυακά στο σύνδεσμο :**

<https://teams.microsoft.com/meet/389110692070812?p=qMnvIqILsjHkIlgI492>

**ΠΕΡΙΛΗΨΗ ΤΗΣ ΕΡΓΑΣΙΑΣ**

Resistive switching (RS) devices and memristors are gaining strong interest as key components for future non-volatile memory and neuromorphic computing, thanks to their small size, low energy consumption, and ability to mimic the behavior of biological synapses and neurons. Among the many materials explored for these applications, metal halide perovskites stand out because of their excellent optoelectronic properties, high ionic mobility, and simple fabrication through solution-based processes. This thesis focuses on the development and study of perovskite-based memristive devices, with an emphasis on multifunctional performance, sustainability, and neuromorphic applications.

The work begins with an overview of resistive switching mechanisms and the fundamental properties of perovskite materials, followed by detailed descriptions of device fabrication and advanced characterization methods. Perovskite solar cells with integrated memristive behavior are



then introduced as self-powered optoelectronic synapses, capable of harvesting energy while processing information simultaneously. The relationship between photovoltaic performance and resistive switching is thoroughly examined, showing that light can effectively modulate switching behavior and enhance synaptic functions.

Various strategies, including mixed-dimensional material design, surface passivation, and electrode interface engineering, are applied to enhance device stability, reliability, endurance, and operating voltage, and these approaches are examined from the perspective of solar cells where these methods are more widely studied. To improve environmental sustainability, lead-free perovskite memristors based on bismuth- and silver-containing compounds are developed. These devices exhibit both volatile and non-volatile switching modes, making them suitable for emulating neurons and synapses..

In addition, optoelectronic memristors are incorporated into neuromorphic systems for multiclass classification tasks, demonstrating their potential for hardware-based artificial intelligence. Detailed electrical measurements and modeling reveal that conductive filament formation, ion migration, and interface effects play central roles in device operation. Comparisons with existing technologies highlight the strong performance of perovskite-based memristors in terms of multifunctionality, low power consumption, and compatibility with neuromorphic computing.

Overall, this thesis presents perovskite memristive systems as a flexible and environmentally friendly platform for next-generation memory and neuromorphic technologies, combining energy harvesting, data storage, and computation within a single device.

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