Institute of Microelectronics of Barcelona IMB-CNM CSIC

The **IMB-CNM** is the largest institute in Spain dedicated to the research and development of Micro and Nano Technologies and Microsystems and with unique capabilities in silicon technology. It belongs to CSIC since its foundation in 1985 and is distinguished as a María de Maeztu Unit of Excellence.

IMB-CNM aims to contribute to the advancement of knowledge and to the economic and social development of society, as well as to the training of researchers and engineers and to the advice to public and private entities.

The research activities of IMB-CNM are dedicated to Micro/Nano Integrated Systems: miniaturized electronic systems which include sensing and/or actuating capabilities in addition to electronic information processing, power management and external interfaces.

The IMB-CNM is located on the Autonomous University of Barcelona (UAB) Campus and contains the largest clean room facilities in Spain with full capability to process its own CMOS technologies and laboratories.

Project Type: TFM

Project Title: The 21st Century Lab Notebook: A Digital Framework for Scientific Documentation in Nanoscience and Microelectronics

Research Group: Micro and Nanofabrication Clean Room

Project Description:

- This TFM aims to design, implement, and validate a modern documentation framework tailored for experimental research in nanoscience and microelectronics.
- The project addresses the reproducibility crisis and knowledge evaporation in high-complexity environments such as cleanroom nanofabrication and advanced characterisation. Using open-source digital tools (e.g. Git, FAIR principles, Electronic Lab Notebooks).
- The student will apply the framework to a real-world pilot project at IMB-CNM, contributing to the strategic goal of modernising the institutional knowledge system.

Work Plan:

The proposed TFM will be structured into four main phases, each designed to progressively develop, implement, and validate a modern scientific documentation framework for experimental research in nanoscience and microelectronics.

Phase I: Research and State-of-the-Art Analysis

- Tool Review: A comprehensive analysis of existing documentation tools and methodologies, with emphasis on those used in regulated environments (e.g. biotechnology, pharmaceutical, industrial R&D).
- Interviews: Discussions with researchers in nanoscience to identify specific documentation challenges in cleanroom processes, chemical synthesis, and materials characterisation.

Phase II: Framework Design

- Template Development: Creation of reusable templates for key experimental processes:
- Lithography process (steps, parameters, equipment).
- Nanoparticle synthesis (reagents, conditions, characterisation results).
- Microscopy sessions (equipment calibration, sample preparation, acquisition parameters).

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- Digital Infrastructure: Setup of a structured repository (e.g. Git-based) to host and manage documentation assets.

Phase III: Implementation and Validation

- Pilot Project Selection: A real experimental project will be chosen from areas such as nanofabrication, nanomaterials synthesis, or advanced microscopy.
- Active Documentation: The student will apply the framework in real-time to document a complex process, such as:
- Monolayer growth via deposition techniques.
- Surface functionalisation for biosensor applications.
- Electrical or optical characterisation of a nanodevice.
- Iterative Improvement: Feedback from real use will guide refinements to the framework.

Phase IV: Synthesis and Reporting

- Best Practices Guide: A concise, visual guide will be produced to summarise the framework and its application, serving as a resource for future researchers.
- Final Thesis Document: The student will write a comprehensive thesis including theoretical background, methodology, implementation details, results analysis, and conclusions.

Candidate desired studies:

- ✓ MSc in Semiconductor Engineering and Microelectronic Design
- ✓ MSc in Nanoscience and Nanotechnology
- ✓ MSc in Telecommunications Engineering

Application Process:

Before applying, please **check with your TFG/TFM program supervisor,** as he/she may already be coordinating with us to assign the project.

If there is no such coordination**, complete this form and send your CV and a motivation letter** to **Talent@imb-cnm.csic.es**, with the **subject: "TFG/TFM at IMB-CNM"**

Your CV will be forwarded to the Researcher leading the project who will contact you directly if interested.

Check our website for more information about the IMB-CNM and our research activities

https://www.imb-cnm.csic.es/en

Take the next step in your research career with us!

*By applying, you accept our data protection policy.

**IMB-CNM (CSIC) adheres to the European Charter and Code of Conduct for Researchers, ensuring full alignment with their principles and requirements, including equal opportunity, transparency, merit and ability, caring for an open, fair, and excellence-based hiring processes.

IMB-CNM holds the HR Excellence in Research award, which acknowledges CSIC's commitment to continuous improvement in HR strategies for researchers.

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