ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

MUR DM 118 - Characterization and Monitoring of physical parameters by applying electronic devices for complex in-vitro models management

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Context of the research activity	The characterization and monitoring of physical parameters within complex in-vitro models are essential for effective management and analysis of these systems. This thesis focuses on the application of electronic devices for the measurement and assessment of various physical parameters, including thermal, electrical, and optical properties. Progetto finanziato nell'ambito del PNRR – DM 118/2023 - CUP E14D23001730006
	In-vitro models serve as valuable tools for studying biological processes, drug development and disease modeling. However, the dynamic nature and intricate structure of these models require precise control and monitoring of physical parameters to ensure accurate experimental outcomes and reliable data analysis. Thermal characterization plays a crucial role in understanding the heat distribution within in-vitro models, as it affects cell viability, metabolic activity and overall system performance. Electronic devices, such as temperature sensors and thermal cameras, enable real-time monitoring and control of thermal parameters, ensuring optimal conditions for cellular growth and function. Electrical characterization is vital for studying the electrical properties of in-vitro models, such as impedance and conductivity. These properties provide

Objectives	insights into cell behavior, membrane integrity, and cellular interactions. Through the integration of electronic devices like electrodes and impedance analyzers, researchers can measure and analyze electrical signals, enabling a comprehensive understanding of the in-vitro system's electrical dynamics. Optical characterization techniques are valuable for visualizing and analyzing cellular behavior and responses within in-vitro models. Electronic devices, such as imaging systems, fluorescent probes, and spectrometers, allow for non-invasive monitoring of various optical parameters, including fluorescence, absorbance, and scattering. This facilitates the observation of cellular morphology, proliferation and the assessment of biochemical processes within the model. Overall, the application of electronic devices for the characterization and monitoring of physical parameters in complex in-vitro models offers significant advantages in terms of accuracy, real-time analysis, and control. These devices provide researchers with valuable insights into the dynamic behavior and response of cells within the model, ultimately contributing to advancements in fields like tissue engineering, drug discovery, and personalized medicine.

Skills and competencies for the development of the activity	The needed competencies include: knowledge of physical parameters relevant to in-vitro models (thermal, electrical, optical, etc.), proficiency in electronics and instrumentation skills, ability to design and develop experimental protocols, competence in data analysis/interpretation, troubleshooting skills for electronic devices, effective collaboration and communication skills, understanding of in-vitro models and biomedical concepts, awareness of regulatory compliance and ethical considerations