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2025 Fall Seminar Series

Dr. Dmitry Kireev

Assistant Professor
Department of Biomedical Engineering
University of Massachusetts Amherst

THURSDAY October 16, 2025
11am-12pm
ESB 121

ABSTRACT:

Atomically Thin Bioelectronics, Wearable E-Tattoos, and Biosensors

Conventional electronic components are rigid and stiff, making them poorly suited for integration with soft, dynamic biological systems such as skin, nerves, and organs. Atomically thin materials such as graphene and other emerging 2D materials offer a transformative alternative. Their flexibility, transparency, and biocompatibility enable seamless interfaces with living tissue while providing powerful electronic and sensing capabilities.

In this seminar, Dr. Dmitry Kireev will highlight how these materials are driving the next generation of bioelectronics. He will discuss graphene microelectrode arrays and transistors for high-fidelity bio interfacing; field-effect transistors as ultrasensitive biosensors for pathogens and biomarkers; imperceptible graphene electronic tattoos for non-invasive monitoring of physiological signals such as blood pressure; cardiac implants; and biocompatible synaptic transistors that emulate brain-like processing. Collectively, these advances open new horizons for wearable, implantable, and neuromorphic bioelectronics. By merging the atomic precision of nanomaterials with the complexity of biology, Dr. Kireev's work demonstrates how 2D material bioelectronics can transform healthcare, enabling continuous monitoring, early disease detection, and novel brain–machine interfaces.

BIOGRAPHY:

Prof. Dmitry Kireev is an Assistant Professor at the Department of Biomedical Engineering at the University of Massachusetts Amherst, working at the frontiers of Bioelectronics: between Electrical Engineering, Biomedical Engineering, Nanoelectronics, and Neuromorphic Computing. His "2D Bioelectronics" Lab is contributing to the development of bioelectronic devices with fundamental implications in Healthcare, Wearables, and Translational Biomedical Devices. Previously, he worked as a Research Associate / Postdoctoral Researcher at the University of Texas at Austin. He completed his PhD work in 2017 at the Institute of Bioelectronics (ICS-8/IBI-3) of Forschungszentrum Julich and RWTH Aachen University, Germany. He is a recipient of a prestigious EMM-NANO scholarship and performed his MSc studies in KULeuven (2012) and Chalmers University of Technology (2013) with majors in nanoelectronics. Dr. Kireev has published 40+ primary research articles in broad scientific outlets, including high-impact journals (*i.e.,* Nature, Nature Nanotechnology, Science Advances, ACS Nano, Advanced Materials, Nano Letters), and field-specific topical journals (*i.e.,* Advanced Healthcare Materials, IEEE tNANO, Carbon). Besides, he has published several book chapters and review articles, contributing to the general development of the fields of bioelectronics and 2D materials.

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For questions, please contact
Visar Ajeti visar.ajeti@uconn.edu
Darcy Richard Darcy.Richard@uconn.edu