MARQUETTE UNIVERSITY

Departmental Colloquium
Electrical and Computer Engineering

Development of Portable Sensor Systems for Detection of Chemical Pollutants in Water in the Field

Tuesday, November 18, 2025
2:00 pm – 3:00 pm
E-Hall Room 136

Reception to follow
3:00 pm – 3:20 pm
E-Hall Room 136

Dr. Florian Bender
Research Assistant Professor of Electrical and Computer Engineering, Marquette University

ABSTRACT: Many situations require detection and quantification of hazardous pollutants in water, often at very small concentrations. This may include monitoring of drinking water and surface water for safe consumption or public use, detection of oil spills and chemical spills in groundwater, monitoring at wastewater treatment plants, and other applications. Accurate quantification of pollutant concentrations is often challenging because of the potential presence of multiple pollutants, formation of precipitate, biofouling, or other factors interfering with sensor system operation. This results in high demands on the selectivity and reliability of a sensor system, often necessitating the use of sensor arrays or multiple sensor parameters, filter systems, sensor signal processing, or specially tailored sensor materials. These challenges will be discussed for the example of a portable sensor system currently under development at Marquette University for the purpose of detection of aromatic and chlorinated organic pollutants as well as PFAS (per- and polyfluoroalkyl substances) in water for direct deployment in the field.

BIOGRAPHY: Dr. Bender is a Research Assistant Professor at the Department of Electrical and Computer Engineering at Marquette University. He received his PhD degree from University of Heidelberg, Germany. His current research focuses on development of SH-SAW (shear-horizontal surface acoustic wave) sensor systems for detection of chemical contaminants in drinking water, groundwater and surface water. His research includes the design of sensor coatings tailored for detection of specific classes of contaminants such as aromatic hydrocarbons, chlorinated hydrocarbons, and PFAS (per- and polyfluoroalkyl substances), appropriate data processing methods based on estimation theory, and the design of novel sensor platforms suitable for PFAS detection.