PURDUE UNIVERSITY | Environmental and Ecological Engineering

EEE Research Seminar
Date: November 26, 2024, at 10:30AM
Location: POTR 234 (Fu Room)

Bin Cao, Ph.D.

Associate Professor
School of Civil and Environmental Engineering
Nanyang Technological University

The Power of Biofilms: Enhancing Sustainability Through Biofilm Engineering

Abstract
In both natural and engineered environments, biofilms represent the most prevalant form of bacterial life. In biofilms, bacteria attach to surfaces or interfaces and develop into structured aggregates, with cells embedded in a self-produced matrix of extracellular polymeric substances (EPS) that provide protection and stability. As a result, biofilms act as self-immobilized systems that exhibit high tolerance to harsh conditions and sustained activity. These charactertistics make biofilms well-suited for continuous processing in industrial operations. Thus, biofilms hold great potential as industrial workhorses across various sectors, from environmental to chemical and biopharmaceutical applications. My research group focuses on understanding the interactions between biofilms and contaminants, as well as biofilm-mediated environmental processes. We aim to apply this knowledge to engineer biofilms for biotechnological applications. In this presentation, I will discuss our recent work on biofilm biology-informed biofilm engineering, specifically, exploring interactions between biofilms and environmental contaminants such as nitrate, arsenic, and plastic in aquatic environments. Additionally, I will highlight how we can engineer biofilms and their interactions with contaminants to achieve environmental sustainability goals.

Bio
Dr. Bin Cao is an Associate Professor in the School of Civil and Environmental Engineering and a Principal Investigator at the Singapore Centre for Environmental Life Sciences Engineering (SCELSE), Nanyang Technological University, Singapore. His research focuses on understanding biofilm-mediated environmental processes and leveraging microbial biofilms to tackle environmental challenges (www.bcaolab.org). Specifically, his team employs tools from environmental engineering, (bio)chemical engineering, microbiology, and molecular/synthetic biology to develop new methods for: (i) exploring biofilm-mediated environmental processes and biofilm-contaminant interactions, (ii) engineering microbial biofilms with defined structural and functional properties, and (iii) developing biofilm-enabled solutions for environmental biotechnology. Current projects in his lab include studying biofilms in drinking water distribution systems, exploring biofilm-plastic interaction in coastal and marine environments, engineering controllable biofilms for contaminant removal and resource recovery, and examining electrochemically active biofilms for microbial electrochemical systems.