

# Department of Electrical and Computer Engineering



TEXAS TECH UNIVERSITY

Edward E. Whitacre Jr.  
College of Engineering

## Spring 2025 Seminar Series

**Seminar Title:** *Next-generation of Molecular Diagnostic Technologies*

**Time:** 2:00-2:50 PM, Monday, Feb. 24, 2025

**Location:** ECE 101

### Speaker:

**Maha Alafeef**

Pennsylvania State University

### Abstract:

Advancements in molecular diagnostic technologies are revolutionizing disease detection, monitoring, and treatment, offering rapid, sensitive, and accessible solutions that have the potential to revolutionize healthcare. In my talk, I will focus on the intersection of electrical and computer engineering with molecular diagnostics, specifically highlighting the use of antisense oligonucleotide-conjugated gold nanoparticles (AuNPs) for fast, cost-effective disease detection. I will present our COVID-19 assay, which leverages an electrical sensor, providing a promising alternative to traditional RT-PCR methods. Beyond COVID-19, I will demonstrate how these technologies can be expanded to address diagnostic gaps in conditions such as sepsis, syphilis, and HIV seropositivity. I will also discuss the application of molecular-based electrical sensors in biothreat detection, demonstrating how engineering principles enable real-time monitoring of infectious diseases and emerging global health threats. By integrating artificial intelligence and next-generation biosensors, these innovations represent a new frontier in diagnostics, combining electrical engineering with biotechnology to enhance global health security and improve patient outcomes.

### Speaker Bio:

Dr. Maha Alafeef is a postdoctoral fellow at The Pennsylvania State University (PSU), where she conducts groundbreaking research at the intersection of bioengineering and translational medicine, focusing on innovative diagnostic technologies and their real-world applications. She earned her M.S. and Ph.D. in Bioengineering from the University of Illinois at Urbana-Champaign. Her research has made a significant impact on the field, particularly in addressing global health challenges such as COVID-19, cancer, and infectious disease diagnosis. Dr. Alafeef developed an innovative diagnostic platform for the novel coronavirus, which received Laboratory Developed Test (LDT) approval from FDA and great interest from national and international laboratories and industry leaders for licensing and commercialization. Dr. Alafeef's contributions to biomedical engineering have been recognized through numerous prestigious awards, including the 2021 Baxter Young Investigator Award, 2021 Collegiate Inventors Competition, 2019 Golden Key Graduate Scholar Award, 2021 Illinois Innovation Prize, and the 2022 Rose J. Martin Award for her outstanding research contributions. She has an extensive publication record, with over 45 peer-reviewed articles in top-tier journals and conferences, along with six published patents, two of which have been licensed and have generated royalties. Her research has been supported by competitive funding from the National Institutes of Health (NIH), Walmart Inc., and an industry partner, and she has played a key role as a co-investigator on a multimillion-dollar CDC-funded project and as a consultant on an NIAID SBIR grant for developing next-generation diagnostic technologies. Her leadership in the field is further demonstrated through her invited presentation at high-profile events such as the 2023 Global Young Scientists Summit (GYSS), 2024 Rising BME Scholars Regional Conference, and the 2017 World Science Forum, where she has shared her insights with global leaders in science, academia, and industry.



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