

Department of Electrical and Computer Engineering



TEXAS TECH UNIVERSITY

Edward E. Whitacre Jr.
College of Engineering

Fall 2026 Seminar Series

Seminar Title: Wide- and Ultrawide-Bandgap Semiconductors for Extreme-Environment Optoelectronics

Time: 2:00-2:50 PM, Monday, Nov 2, 2026

Location: ECE 101

Speaker:

Dr. Hieu Pham Trung Nguyen.

Abstract:

Optoelectronic devices that operate reliably under extreme temperatures and harsh environmental conditions are increasingly important for aerospace, defense, hypersonics, combustion and turbomachinery, and downhole energy systems. Conventional III-nitride thin-film light-emitting diodes (LEDs) can experience substantial efficiency loss and structural degradation at elevated temperatures, limiting their use in these demanding settings.

In this seminar, I will discuss InGaN/AlGaN nanowire LEDs designed for extreme-temperature operation. The axial nanowire heterostructures were grown by plasma-assisted molecular beam epitaxy under nitrogen-rich conditions and consist of an n-GaN base, InGaN/AlGaN multiple quantum wells, and a *p*-GaN cap. Devices were electrically and optically characterized from 25 to 1000 °C, maintaining diode behavior and electroluminescence across the measured range. Their thermal stability is associated with the nanowire geometry, which can support strain relaxation, reduced dislocation densities, heat dissipation, carrier confinement, and sidewall passivation.

The seminar will also highlight current research at Texas Tech University (TTU) on wide- and ultrawide-bandgap semiconductors and their potential for optoelectronic and other device applications. Finally, I will discuss plans for the Semiconductor Nanofabrication Center, a facility to support semiconductor research, fabrication, and education at TTU.

Speaker Bio:

Dr. Hieu Pham Trung Nguyen is a Professor of Electrical Engineering at Texas Tech University (TTU), where he leads research in advanced semiconductor materials and photonic and electronic devices. His Wide/Ultrawide-Bandgap Semiconductors Laboratory focuses on the epitaxial growth, fabrication, and characterization of high-performance devices, including light-emitting diodes, lasers, photodetectors, solar cells, high-electron-mobility transistors, and memory devices.

Dr. Nguyen has authored or co-authored more than 150 journal articles and delivered over 180 conference presentations, including numerous invited and plenary talks. He also serves as an editor for Materials in Semiconductor Processing (IF=5.2), an Elsevier journal.