Department of Electrical and Computer Engineering

TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr.
College *of* Engineering

Spring 2026 Seminar Series

Seminar Title: ***Chiral and quantum phononics in terahertz frequencies***

Time: 2:00-2:50 PM, Monday, Apr 13, 2026

Location: ECE 101

Speaker:
Hanyu Zhu
Rice University

Abstract:
Phonons in semiconductors are often considered detrimental because they reduce electronic mobility and produce heat through electron-phonon coupling. In the meantime, phonons are also useful for removing excessive heat from devices. Furthermore, it is possible to turn the loss into gain, by utilizing phonons to alter electronic states and/or carry information. In this talk, I will first briefly introduce the concept of chiral phonons and our recent work on manipulating spins via atomic rotations that generate large effective magnetic fields. Using high-resolution magneto-Raman spectroscopy, we identified all chiral phonons in CeF3 and thoroughly understood the quantum-mechanical origin of the unusually strong spin-lattice interaction. We also realized record-long quantum coherence in another semiconductor, BAs, based on a simple but counterintuitive quantum mechanics principle, that a particle may lose energy more slowly when it has too much energy. Our results lead to a new concept of dynamic structural-property relationship in quantum materials and potentially new approaches to realize phononic quantum devices.

Speaker Bio:
Dr. Hanyu Zhu is an associate professor of Materials Science and NanoEngineering at Rice University, with joint appointment in Physics and Astronomy, as well as Electrical and Computer Engineering. He earned his B.S. in Mathematics and Physics at Tsinghua University in China, when he got into the field of nanomaterials. He obtained his Ph.D. in Applied Science and Technology at the University of California in Berkeley for studying electromechanics of atomically thin crystals. After postdoctoral research at Berkeley developing new optical spectroscopy for phonons, he started the Emerging Quantum and Ultrafast Materials Lab in 2018, with a focus on bosonic excitations of quantum materials. He has a joint appointment in the department of Physics and Astronomy, and is part of the Rice Center for Quantum Materials. He received the ORAU Ralph E. Powe Junior Faculty Enhancement Award in 2019, the NSF CAREER Award in 2023, and the AFOSR Young Investigator Award in 2024.