

MECHANICAL ENGINEERING

**Seminar**

**Dr. Griffin Corpening**

**Harnessing Nonlinear Dynamics and Vibrations: From Offshore Wind to Footstep Power**

**Feng Qian, Ph.D.**

**Time:3:10pm Date: MAY 7th, 2024**

**Location: EN 1045**

**ABSTRACT:** This presentation highlights advancements in engineering mechanics, nonlinear dynamics, and vibration control, with a focus on offshore wind energy and biomechanical energy harvesting. I will primarily discuss our recent research on the development and validation of a 14-DOF rigid-flexible multibody dynamics model for semi-submersible floating offshore wind turbines. Validated against NREL's FAST simulations, this model offers potential for advanced vibration control, design optimization, and enhanced wind energy generation performance. Additionally, I will explore novel approaches to nonlinear vibration energy harvesting, featuring a bi-stable piezoelectric energy harvester inspired by the Venus flytrap and an embedded piezoelectric footwear harvester. These projects demonstrate the potential of leveraging nonlinear dynamics and vibrations to scavenge sustainable energy from natural and human-generated motions, with applications in wearable electronics, robotics, and smart healthcare monitoring systems. The presentation will conclude with an outline of my future research vision, aimed at driving advancements in engineering mechanics for clean energy and its diverse applications.

**BIOGRAPHY: Dr. Feng Qian** is currently an Assistant Professor in the Department of Mechanical Engineering Technology at Penn State Behrend. Before joining Penn State, he was a Research Associate/ Postdoctoral Scholar in offshore wind energy and energy conversion at Virginia Tech, where he received his PhD degree in Mechanical Engineering. Additionally, Dr. Qian holds a PhD degree in Engineering Mechanics from Hefei University of Technology. His research focuses on engineering mechanics, nonlinear dynamics, vibrations, and metamaterials, with a particular emphasis on offshore wind energy and energy conversion. Dr. Qian’s work encompasses diverse applications, including sustainable power supply for wireless sensors, health monitoring, marine animal tracking, and smart infrastructures. Employing nonlinear dynamics, vibration and control, bio-inspired design, multidisciplinary system-level simulation, and experimental validation, he develops innovative solutions to address challenges in these areas. His research has been supported by NSF, DOE, ONR, and NOWRDC, resulting in over 30 journal publications. His academic journey reflects his dedication to advancing knowledge and innovation in engineering mechanics for clean energy.