SDSU | College of Engineering Mechanical Engineering

Mechanical Engineering Seminar Series

March 24, 2026, 11:00AM

Dean's Conference Room, E-203E

Title: Bioinspired Aerial Robotics: From Birds to Insects

Dr. Hoang-Vu Phan
University of Nevada, Reno

Abstract: Birds and insects exhibit remarkable flight maneuverability and adaptability across diverse environments, outperforming existing human-designed drones. They have therefore become a key source of inspiration for the development of robotic systems, expanding the possibilities for drone applications. In this talk, I introduce bird- and insect-inspired drones that closely replicate morphing and flapping flight, and other locomotion modes of their biological counterparts. The bird-inspired drones feature morphing wings and tail covered with feather-like structures, enabling agile maneuvers. Additionally, the winged drone with bird-inspired multi-functional legs can jump rapidly into flight, can walk on ground and can hop over obstacles and gaps similar to the multi-modal locomotion of birds. At the insect scale, our insect-inspired flapping-wing drones can perform untethered flight for approximately nine minutes, execute effortless wing deployment and retraction without additional actuators, recover from in-flight wing collisions, and traverse tight gaps smaller than their wingspan. These platforms demonstrate enhanced maneuverability, environmental adaptability, and robust navigation in cluttered spaces, unlocking a wide range of applications including search and rescue, all-terrain and planetary exploration, wildlife observation, education, and entertainment. Furthermore, with the bio-informed design, these drones deepen our understanding of natural biomechanics, which are challenging to identify directly in live animals within lab settings.

Bio: Hoang-Vu Phan is currently an Assistant Professor in Aerospace Engineering at the University of Nevada, Reno, USA. He received MS and PhD degrees in biomimetics and intelligent microsystems from Konkuk University, Seoul, South Korea in 2012 and 2017, respectively, and BE degree in aerospace engineering from the Vietnam National University - Ho Chi Minh city University of Technology, Ho Chi Minh, Vietnam in 2010. From 2021 to 2025, he was a Senior Postdoctoral Scientist at the Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland. Prior to joining EPFL, he was a non-tenure-track Assistant Professor in the Department of Smart Vehicle Engineering, Konkuk University, Seoul, Korea (2017-2021). His research interests include biologically inspired aerial robotics, multimodal locomotion, flapping-wing flight, and biomechanics of animal flight. He has published one book and more than 30 papers in prestigious journals across various disciplines including *Nature, Science, Science Robotics,* and *Progress in Aerospace Sciences*. Dr. Phan currently serves on the editorial boards of *npj* Robotics (Nature Portfolio), and *Aerospace*.