SDSU College of Engineering Mechanical Engineering

Mechanical Engineering Seminar Series

November 12, 2026, 11:00AM

Dean's Conference Room, E 203E

Title: From Cell Mechanics to Multicellular Self-Organization: Mechanobiology of 3D Bone Organoids

Dr. Jeonghyun Kim

Kyushu University, Japan

Abstract: Cells continuously sense, generate, and respond to mechanical forces in their surrounding environment, and these interactions regulate a wide range of cellular behaviors, including migration, differentiation, tissue organization, and self-organization. In this seminar, I will introduce our recent studies in cell biomechanics and mechanobiology, focusing on how mechanical cues regulate multicellular systems. Our work combines mechanical stimulation, mechanical characterization, and scaffold-free three-dimensional culture to investigate cellular responses across multiple scales. I will present examples of how cells respond to external mechanical stimuli and how cell–cell and cell–substrate interactions contribute to collective behavior, followed by our development of scaffold-free spheroid models and their application to bone tissue engineering. In particular, we have investigated the long-term maturation of bone spheroids, including changes in mineralization, mechanical properties, and cellular responses to hydrostatic pressure. These studies provide a platform for exploring how mechanical properties emerge during multicellular self-organization and tissue maturation. Finally, I will discuss future opportunities to combine experimental 3D culture models with computational approaches to better understand the mechanics of self-organizing tissues and bone organoids.

Bio: Jeonghyun Kim is an Associate Professor in the Department of Mechanical Engineering at Kyushu University, Japan. He received his B.Eng. in Biomedical Engineering from the University of Sydney, Australia, in 2010, followed by an M.Eng. and Ph.D. in Mechanical Engineering from the University of Tokyo, Japan, in 2014 and 2017, respectively. After completing postdoctoral training at the University of Tokyo and Kyoto University, he joined Nagoya University as an Assistant Professor in 2021. In 2025, he moved to Kyushu University as an Associate Professor. His research focuses on understanding how mechanical forces and microenvironments regulate cellular and multicellular behavior, with particular interests in scaffold-free 3D culture, bone spheroids/organoids, mechanical stimulation, and tissue mechanics.