

TEACHING SEMINAR

Fundamental Concepts in Control: System Representations, Analysis, and Controller Design

**THURSDAY, NOVEMBER 21, 2024 3:00PM - 4:00 PM
ARMS 1103**

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ABSTRACT

Control is a key component in the development of autonomous systems such as drones, satellites, robots, autonomous vehicles, smart power grids, and intelligent buildings. It involves designing and implementing strategies to regulate the behavior of systems to achieve desired outcomes. Effective control in real-world applications requires continuous monitoring of system behavior and applying corrective actions through feedback mechanisms to ensure stability, accuracy, and optimal performance.

This teaching demonstration will provide a comprehensive overview of the fundamental concepts of control. We will start by exploring the three system representations: state-space, time domain, and frequency domain. Next, we will dive into frequency domain analysis, which offers valuable insights into system response to various inputs. Finally, we will present the principles of controller design and explain how they can be applied to achieve system stability, robustness, and high performance.

BIOGRAPHY

Sooyung Byeon is a postdoctoral researcher in Aeronautics and Astronautics at Purdue University. He earned his Ph.D. in Aeronautics and Astronautics from Purdue University in 2024. From 2014 to 2019, he worked as a Senior Satellite Flight Control Software Engineer at Satrec Initiative, Ltd. He received his bachelor's and master's degrees in aerospace engineering from the Korea Advanced Institute of Science and Technology (KAIST) in Daejeon, South Korea, in 2012 and 2014, respectively. His recent research focuses on developing cyber-physical-human systems (CPHS) that facilitate teaming between autonomous (cyber-physical) systems and humans for control and decision-making in complex and uncertain environments. His research interests include human modeling, reinforcement learning, human-autonomy teaming, and applied experimentation.