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ORTA DOĞU TEKNİK ÜNİVERSİTESİ

Department of Aerospace Engineering SEMINAR

Sustainable Aviation Meets Advanced Computing: Tools and Methods for the Future of Flight

Asst. Prof. Gökçin Çınar

Aerospace Engineering Department
University of Michigan

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METU Aerospace Engineering Department Auditorium

Achieving net-zero emissions in aviation by 2050 demands a transformative approach to aircraft and propulsion system design, as well as a re-evaluation of operational strategies. At the Integrated Design of Environmentally-friendly Aerospace Systems (IDEAS) Laboratory at the University of Michigan, we explore the new aircraft design space created by revolutionary aerospace technologies, such as electrified and hydrogen propulsion, to maximize environmental and performance benefits by combining physics-based modeling with advanced data-driven methods, including machine learning and surrogate modeling. This seminar will present our latest computational advancements in integrating alternative energy sources, such as battery and fuel cell systems, within hybrid-electric propulsion architectures to optimize energy storage, mission planning, and power management. By leveraging these methods, we address the system-level challenges of propulsion system electrification, focusing on how these novel architectures open new design spaces for hybrid-electric aircraft. Supported by NASA funding, we have developed computational tools—including the recently released open-source Future Aircraft Sizing Tool (FAST)—to support design flexibility across propulsion architectures and enable early-phase sizing and data-driven projections of key performance parameters.

Dr. Gökçin Çınar is an Assistant Professor of Aerospace Engineering at the University of Michigan and the Director of the IDEAS Lab. Her research centers on systems design, integration, and optimization of aerospace technologies, with a focus on future aircraft concepts for sustainable aviation and electrified propulsion. Over the past decade, she has developed computational tools and methods adopted by academia, government, and industry, promoting a systems-level approach to assessing the environmental impact of aircraft design and operations. She is the recipient of the 2024 International Sustainable Aviation and Energy Research Society Young Scientist Award and has authored three AIAA and IEEE best papers for her novel contributions to design space exploration and multidisciplinary analysis and optimization of electrified aircraft.