



MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Thursday, July 3, 2025, at 13:30-14:00, D. Dan and Betty Kahn Building, Room 217

Endurance performance of an unmanned aerial vehicle employing the combined electro-thermo-chemical cycle

Roe Danan

Adviser: Prof. Leonid Tartakovsky

This seminar presents the research on a feasibility of a novel hybrid propulsion architecture based on the Combined Electro-Thermo-Chemical (CETC) cycle for Unmanned Aerial Vehicles (UAVs). The CETC approach combines a Solid Oxide Fuel Cell (SOFC), an Internal Combustion Engine (ICE), and a thermochemical recuperation of waste heat to enhance the overall energy conversion efficiency and flight endurance.

The study explores how this hybrid configuration can address growing challenges in aviation, including the need for cleaner energy sources, improved fuel utilization, and extended mission capabilities. Various synthetic fuels were assessed for compatibility and performance, with an emphasis on identifying the most practical and efficient option for integration.

A theoretical thermodynamic model was developed and validated against real-world engine data to simulate system performance under different operating conditions. Key aspects such as fuel cell power density, ICE mass, and fuel type were analyzed to determine their impact on UAV range and efficiency. The seminar will walk through the modeling approach, fuel selection process, validation efforts, and system performance evaluation across multiple UAV scenarios. The work aims to assess whether CETC hybridization offers a viable pathway for the next generation of sustainable, long-endurance UAV propulsion systems.

Note: the seminar will be given in Hebrew.