



Electrical and Computer Engineering

Spring 2017 Seminar Series

Power Electronics Enabled Next Generation Systems of Systems

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11:00 AM – HEC 450

Cell phones, computers, electric vehicles, airplanes... are revolutionary systems combining generations' multi-disciplinary intelligence. In the foreseeable future, individual systems as such are integrated to form larger and more complex systems: autonomous vehicles, energy-efficient buildings, electric aircraft, and smart grids, to name a few. Resulted energy exchange increase in electrical as well as multi-physics domains requires an efficient and intelligent energy processing mechanism. Power electronics, the engineering of energy conversion using solid-state electronics, serves as an indispensable link in such energy management.

In this presentation, two complex systems: one stationary as in energy-efficient buildings and another mobile as in more electric aircraft, lead to the exploration of power electronics enabled system-level power optimization in electrical and thermal domains. The talk introduces a bi-directional virtual thermal storage concept and discusses how this storage can be controlled via power electronics means to contribute thermal inertia to a power system. This practical and economic methodology addresses critical challenges pertained to stability, efficiency, and storage requirement in next generation highly stochastic and power dense energy systems. A side theme touches briefly on integrated modularized power converters, with system-level design considerations, as key technology enablers to boost power density in future transportation electrification.

Yue Cao

University of Illinois at Urbana-Champaign



Yue Cao (BSEE-Math'11, MSEE'13) is a Ph.D. candidate with adviser Prof. Philip Krein in electrical engineering at the University of Illinois at Urbana-Champaign (UIUC). His research interests include power electronics, motor drives, and energy storage. Yue has been a Power Electronics Engineer Intern with Apple Inc., Halliburton Company, Flanders Electric, Oak Ridge National Laboratory, and MLGW-Memphis Utility. He received the Myron Zucker Award from the IEEE Industry Applications Society in 2010. He was a Sundaram Seshu Fellow (2016) and a James M. Henderson Fellow (2013) at UIUC. He has been rated as an Excellent Teaching Assistant for multiple years since 2013. Yue served as the Corresponding Technical Programs Chair of the 2016 IEEE Power and Energy Conference at Illinois. From 2012 to 2013, he was the President of the IEEE PES/PELS/IAS Student Chapter at UIUC.