

EECS 598 Special Topics Infrastructure for Vehicle Electrification

Tuesday/Thursday, 3:30-5:00pm
Fall 2018



The course covers the fundamentals of the physical and cyber infrastructures that will underpin large-scale integration of plug-in electric vehicles (EVs). EV charger technology will be examined, with a particular focus on grid-side characteristics. V2G converter requirements will be considered. An overview of the design and operation of power systems will be provided. This will form the basis for a detailed examination of grid integration issues arising from large-scale charging and fast charging strategies. Quality-of-supply issues and protection requirements will be addressed. The information infrastructure and regulatory framework required to support various business models for flexible EV charging will be presented. Control strategies for coordinating large-scale EV charging will be developed. Upon completion of the course, students should have a comprehensive knowledge of the structure, capabilities and limitations of the physical and cyber infrastructures required to support large-scale EV integration.

Syllabus:

1. Power system overview: Distribution supply systems; Reliability; Protection; Impact of high EV penetration; Fast charging; Vehicle-to-grid integration.
2. Vehicle-grid interface: Grid-to-vehicle and vehicle-to-grid converter technologies; Standards; Safety systems; Quality-of-supply; Information transfer.
3. Business models for ubiquitous charging facilities: Cyber-infrastructure requirements for supporting smart/dumb charging.
4. System-wide control of charging: Time-based and price-based load shifting strategies; Optimal control of EV charger demand; Hierarchical control structures; EV control for supporting renewable generation.

Prerequisites: EECS 215 or 314 (or Permission of Instructor).

Course Director: Prof Ian Hiskens, Electrical Engineering and Computer Science.
For additional information contact <hiskens@umich.edu>.