

ME 597: Distributed Energy Resources – Spring 2024

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Distributed energy resources (DERs) are controllable electrical devices that plug in at the edge of the power grid, typically through buildings. DERs – such as electric vehicles, heating and cooling equipment, energy storage systems, and rooftop solar photovoltaics – will play an increasingly important role in future energy systems that decarbonize, digitalize, and decentralize their operations. In this class, students will learn to model a variety of DERs, optimize DER designs, and control DERs to reduce costs, pollutant emissions, and impacts on the power grid. This class will involve a mix of coding and mathematical analysis. Students will do semester projects on current DER research topics of their choosing.

Topics:

- Introduction to energy systems and DERs
- Modeling DERs using differential and difference equations
- Learning DER models from data
- Designing DERs using convex optimization
- Controlling DERs for costs, emissions, and power grid services

Prerequisites:

- Facility with programming in Matlab, Python, or Julia
- Familiarity with ordinary differential equations and linear algebra