REU Site: Engineering research in a liberal arts and entrepreneurship context

Electric Power Systems

Mentor: Prof. Luke Dosiek

Professor Dosiek applies statistical signal processing and system identification theory to the area of electric power systems. Past projects have focused on the problem of estimating electromechanical modes from synchrophasor data acquired from Phasor Measurement Units (PMU), and have included deriving a multichannel least squares mode meter that can estimate both modes and mode shapes simultaneously, a recursive maximum likelihood mode meter that can provide confidence in the mode estimates in near real-time, and simulation studies that have used Monte Carlo simulations to document the performance of mode meters under a variety of conditions, including the forced oscillations. Recent work has focused on building a complete workflow for power system mode meters that a) detects oscillations, b) estimates their parameters, and c) uses them to provide unbiased estimates of the mode frequency and damping that achieve minimum variance. Anticipated projects for Summer 2026 include Python-based real-time implementations of the most recent mode meter algorithms, and testing them on various grid models using an Opal-RT real time digital simulator. Also planned is a study into the observability of system modes in grids with high penetration of inverters, and in particular microgrids.

[Learn more about Prof. Luke Dosiek](#)