Description: A comprehensive introduction to the secure and economic operation of modern electrical energy systems. Computational methods used in bulk real-time operations. Technologies of modern Energy Management Systems (EMS) and energy control centers. Operation with distributed energy resources. Real-time control of emerging distribution systems, Distribution Management Systems (DMS), and smart grids.

Time and Place: MWF, 12:20 pm -1:10 pm, Klaus 2443

e-mail: sgrijalva@ece.gatech.edu

Office Phone: (404) 894-2974

Pre-requisites: ECE 4320 or ECE4321 or some familiarity with the electrical energy industry

Office Hours: Monday, 1:30 – 2:30 pm.

Text: Instructor will post notes on T-Square

Instructor will provide list of related Texts and literature


Term project: 15 points. Final Exam: 35 points.

Topics:

0. Introduction to power system operation paradigms and functions
1. Real-Time Steady-State Computation
   Fast and Robust Power Flow Computation, Sparsity Techniques, Sensitivity Analysis, Contingency Analysis, Available Transfer Capability
2. Economic Functions
   Forecasting, Economic Dispatch (ED), Non-Linear Optimal Power Flow (OPF), Linear Programming OPF, Marginal Pricing, Security-Constrained OPF, Unit Commitment, Stochastic Optimization of Renewables
3. Energy Management Systems Architectures
   Substation Automation, Central System Architecture, Unified Modeling Situational Awareness and Visualization, Synchronized Phasor Measurement (PMU).
4. State-Estimation
   Review of Estimation Theory, WLS and Decoupled Estimation Observability, Bad Data Detection, Robust State Estimation
5. Distribution Systems
   Distribution System Modeling and Simulation, Distribution Management Systems, Operation with Distributed Energy Resources, Introduction to Smart Grids