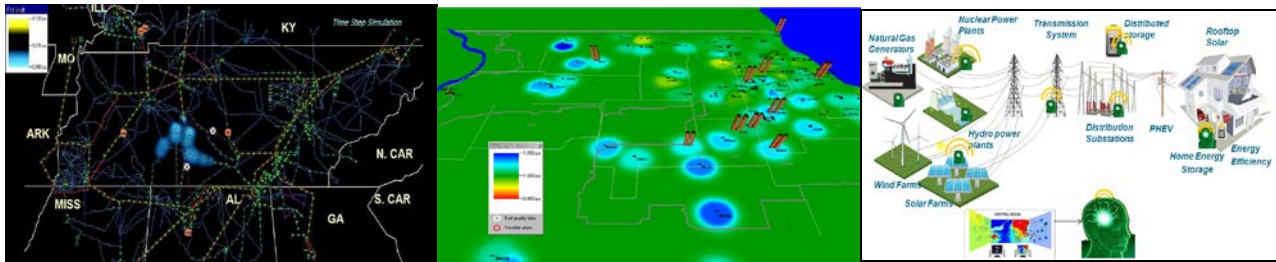


# ECE 6320 Power System Control and Operation

## Fall 2017: Prof. Santiago Grijalva



**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

**Grading Policy:** Quiz 1: 15 points. Quiz 2: 15 points. Homework: 20 points.

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