**Power System Economics**

**Instructor:** Santiago Grijalva

**Description:** This course provides a comprehensive introduction to electricity economics, including economic theory, electricity markets, and policy. The behavior of the physical system including the grid, and the market is modeled in detail and simulated through software. Market interactions are simulated through auction and trading exercises. Emphasis is given to current trends: renewable energy, information systems, smart grid, and consumer empowerment as drivers for market architecture.

**Grading Policy**: On ground delivery: weeks 3 and 6

Homework: 30%: hw1 set due week 4, hw2 set due week 7

Two Tests: 40%: 20% each at the end of the on ground delivery (w2 and w6)

Term Project 30%: proposal due w5, project due w8.

**Topics**:

1. Electricity Industry Megatrends and Challenges

2. Review of Economic Theory and Electricity Supply and Demand

3. Markets and Risk Management

4. Electricity Market Architecture

5. Producer Participation: Strategy, Scheduling

6. Introduction to Utility Regulation

7. The Consumer Participation and Retail Markets

8. Demand Response Program Economics

9. Demand Response Lessons Learned

10. Reserves and Ancillary Services

11. Linear Programming Methods

12. The Grid: Modeling and Sensitivities

13. Software Simulation of the Grid

14. Methods of Economic Dispatch

15. Optimal Power Flow and Marginal Prices

16. Security Constrained Optimal Power Flow

17. Co-optimization of Energy and Reserves

18. Congestion Management

19. Emissions Dispatch and Carbon Trading

20. Investment and Asset Management

21. Oligopoly and Market Power

22. Market Management Systems

**Text**: Instructor will provide full set of lecture notes. Extensive list of references will be provided.

**Supplemental References**

1. D. Kirschen, G. Strbac, Fundamentals of Power System Economics, John Wiley, 2004
2. J. Momoh, L. Mili, Economic Market Design and Planning for Electric Power Systems, (IEEE Press Series on Power Engineering), Wiley, 2009
3. S. Stoft, Power System Economics: Designing Markets for Electricity, Wiley, 2002
4. G. Rothwell, T. Gomez, Electricity Economics, IEEE Press, Wiley-InterScience, 2003
5. PowerWorld, Simulator V16.0 User’s Guide, PowerWorld Corporation, 2012
6. M. Shahidehpour, Market Operations in Electric Power Systems, IEEE Press, Wiley, 2002