Type: Elective  
Credits/ECTS: 3 Credits / 6 ECTS  
Class/Laboratory/PS schedule: Wednesday 15:00-16:50 (M2180) – Regular Class  
Friday 11:00-11:50 (M2181) – Regular Class  
Instructor: Gürkan Kumbaroğlu  
Office Hours: W 10:00 – 12:00, Th 15:00-16:00  
Prerequisite(s): IE 202 (Operations Research I)  

Course Description:  
This course investigates the substance of essential energy policy issues and provides the necessary skills for their planning. Electricity market restructuring and climate change mitigation are addressed as today’s two distinct energy policy challenges. Fundamentals of electricity markets are explored in the first part of the course. The market clearing mechanism for electricity trading in a competitive environment is elaborated with focus on the underlying microeconomic theory. Short- and long-run equilibrium conditions in the electricity market are studied. The grid and reliability issues are explored together with the implied formulations for modeling power flow and auctions. An interactive power market simulation game is included to complement the understanding of theoretical issues. In the second part of the course, the basic concepts and different approaches used in energy and environmental policy modeling are explored ranging from technologically detailed bottom-up energy models to top-down policy models. Modeling energy flow, optimization and equilibrium, modeling the macroeconomy and representing energy-economy interactions form the learning objectives of this part. Particular emphasis is on the theory of production in general and constant elasticity of substitution (CES) type production functions in particular. The course includes various practical case studies applied using the GAMS software.  

Textbook(s) / other required material:  
A compilation of lecture notes will be available for the participants section by section, on a periodic basis. Additionally, the following books are reserved at the library for this course. Although none of them covers all the course topics, you may find them useful at certain sections of the course as supporting textbooks.  


Furthermore, you may find the following additional readings useful:  
subject to peak load pricing, Energy Policy 35: 5130-5135.


**Learning goals**

- gain an understanding of electricity market restructuring and climate change mitigation with emphasis on modeling
- understand modeling approaches of interdisciplin ary nature integrating economic theory with engineering knowledge
- model long-run electricity market equilibria, develop energy and environmental policy models
- analyze electricity market reforms, conduct quantitative analyses to explore energy-economy-environment interactions
- understanding electricity market restructuring from a microeconomic perspective
- gain hands-on policy modeling experience through in-class exercise
Topics covered:

**Part I: Power System Economics & Modeling**
- Power Market Fundamentals & Competitive Pricing
- Market Power, Indicators & Control
- Modeling Market Power
- Power Supply and Reliability
- Electricity Market Simulation
- The Grid & Optimal Power Flow

**Part II: Energy and Environmental Policy Modeling**
- Energy Use and Climate Change
- Energy Policy Optimization Modeling
- Energy Policy Equilibrium Modeling
- Modeling of Energy-Economy Interactions

**Grading:**
- Midterm I: 20%  **November 12, Wednesday  15:00-17:00**
- Midterm II: 20%  **December 17, Wednesday 15:00-17:00**
- Final: 40%
- Assignments: 20%

**Eligibility For The Final Exam:**
You will have the right to take the final exam only if you fulfill the following condition:
- Have scored a weighted average score higher than 30/100

*Prepared by, and date of preparation: Gürkan Kumbaroğlu, September 2014*