

## **DIE-OPT-434 Energy Economics: Primary Sources, Electric Power Systems and Market**

**SEMESTER:** Spring  
**CREDITS:** 3 ECTS (2 hrs. per week)  
**LANGUAGE:** English  
**DEGREES:** IEM, ITL, SAPIENS program

### **Course overview**

The course presents an interdisciplinary perspective of the energy sector, with a special focus on the electric power sector, linking the engineering, economic, legal and environmental viewpoints. The course reviews the whole electricity supply value chain, from the analysis of the key primary energy sources (hydrocarbons, nuclear and renewable ones) to the description of the main electricity activities (generation, transmission, distribution and retail) and the different regimes in which they operate (regulated monopolies or under competitive conditions), with a special focus on the review of the fundamentals needed to approach the market designs currently implemented worldwide.

The knowledge acquired in the course will provide the comprehensive understanding of electric power systems that will be needed for research in this field, as well as for future professional activities in the energy sector, whether in industry, government or consulting.

### **Prerequisites**

None.

### **Course contents**

MODULE 1: Introduction

Introduction to Energy Economics

Sources, units, sector structure and perspectives

MODULE 2: Review of the primary energy sources

Review of the primary energy sources (exploitation, transport, markets)

MODULE 3: Energy commodities markets

Spot and futures/forward markets

MODULE 4: Financial fundamentals of the energy sector

Project financing.

Portfolio theory.

MODULE 5: Electric power systems

System balance: Demand and Generation

Networks: Transmission & distribution

MODULE 6: Electric power markets

From monopolies to markets

Operation

Investment

## Textbooks

- J. Barquín. Economía, energía y sociedad. Universidad Pontificia Comillas. 2004.
- D.G. Luenberger. Investment science. Oxford University Press 1998.
- I.J. Perez---Arriaga. Regulation of the Power Sector. Springer---Verlag, 2013.

## Grading

The overall grade is obtained as follows:

Mid-term exam: 30%

Final term exam: 40%

Participation in the class: 10%

Term paper: 20%