Last update: 08-05-2019

820736 - ME - Energy Markets

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering

Teaching unit: 709 - DEE - Department of Electrical Engineering
715 - EIO - Department of Statistics and Operations Research

Academic year: 2019

Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2012). (Teaching unit Compulsory)
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2013). (Teaching unit Compulsory)
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: Roberto Villafáfila Robles

Others: Roberto Villafáfila Robles
F. Javier Heredia Cervera

Opening hours

Timetable: Make an appointment via e-.mail:
roberto.villafafila@upc.edu
f.javier.heredia@upc.edu

Prior skills

Background on energy systems and their operation, economy and linear programming.

Requirements

To have done Energy resources and The power grid.

Degree competences to which the subject contributes

Specific:

CEMT-8. Understand, describe and analyse, in a clear and comprehensive manner, the functioning of energy markets and carry out the optimum procurement of energy supplies

CEMT-9. Undertake projects related to energy management in production and service sectors, recognise and value advances and developments in the field and contribute innovative ideas.

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Teaching methodology

- In-person class:
Lectures (CM): 20 h
Active lectures: 10 h
Theoretica-practical work (TD): 13 h
Evaluation activities (EV): 2 h
- No attendance:
Limited scope project/activity (PR): 15 h
Broad scope project/activity (PA): 25 h
Self-study (EA): 40 h

Learning objectives of the subject

Know, understand and be able to apply existing concepts in the field of energy markets.

Study load

Total learning time: 125h	Hours large group:	30h	24.00%
	Guided activities:	15h	12.00%
	Self study:	80h	64.00%

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Content

Energy markets structure

Learning time: 62h 30m

Theory classes: 14h
Guided activities: 8h 30m
Self study : 40h

Description:
Introduction to energy markets. Stakeholders and rules of different energy markets. Trading.

Related activities:
Electricity market analysis.

Specific objectives:
Understand the energy markets in within the socio-techno-economic frame, their particularities depending on the type of energy, and the different options of trading.

Optimal operation in energy markets

Learning time: 62h 30m

Theory classes: 16h
Guided activities: 6h 30m
Self study : 40h

Description:
Mathematical models and optimization techniques applied to operation issues problems in energy markets.

Related activities:
Optimal operation of electricity market.

Specific objectives:
Knowing the different optimization problems of the stakeholders and operators of energy markets and be able to model and solve computationally.

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Planning of activities

Energy market analysis	Hours: 8h 30m Guided activities: 8h 30m

Description:
Activity to be developed in groups to improve the background about the performance of energy markets.

Support materials:
Lectures notes, bibliography.

Descriptions of the assignments due and their relation to the assessment:
Report dealing with topic proposed.

Specific objectives:
Analyze rules, estructures and characteristics for a indivudual energy market.

Optimal operation in energy markets	Hours: 6h 30m Guided activities: 6h 30m

Description:
Individual activity to implement the models and optimization techniques applied in the operation of energy markets presented in the theoretical sessions.

Descriptions of the assignments due and their relation to the assessment:
Lecture notes. Mathematical optimization software. Bibliography.

Specific objectives:
Be able to solve with mathematical optimization software energy markets operation problems based on real data.

Qualification system

Writing exam (PE): 60%
Individual/group assignment (TR): 40%

Regulations for carrying out activities

The writing exam (PE) will deal with the issues described during the course. Any kind of supporting material is not allowed.
There will be two practical assignments (TR) that will be developed in groups. The assignments will be delivered in writing format.

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Bibliography

Basic:

Kirschen, Daniel Sadi; Strbac, Goran. Fundamentals of power system economics. Chichester [etc.]: John Wiley & Sons, cop. 2004. ISBN 0470845724.

Gómez Expósito, Antonio; Conejo, Antonio J.; Cañizares, Claudio. Electric energy systems : analysis and operation [on line]. Boca Raton: CRC Press, cop. 2009 [Consultation: 02/11/2016]. Available on: <http://site.ebrary.com.recursos.biblioteca.upc.edu/lib/upcatalunya/detail.action?docID=10240643>. ISBN 9780849373657.

Complementary:

Nocedal, Jorge; Wright, Stephen J. Numerical optimization [on line]. 2nd ed. New York, NY: Springer, 2006Available on: <http://dx.doi.org/10.1007/978-0-387-40065-5>. ISBN 9780387400655.

Zhu, Jizhong. Optimization of power system operation [on line]. Piscataway, N.J: Wiley-IEEE, cop. 2009Available on: <http://lib.myilibrary.com?id=227867>. ISBN 9781282278677.