

820774 - ESEP - Efficiency in Power Systems

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Optional)
ECTS credits: 5 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Sumper, Andreas
Others: Roberto Villafáfila Robles
F. Javier Heredia Cervera
Andreas Sumper

Opening hours

Timetable: Make an appointment via e-mail.

Prior skills

Knowledge of power systems and linear programming.

Requirements

Have taken the speciality courses of the subject Energy economy and markets, and the compulsory course Energy markets.

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-3. Assess the economic, social and environmental impact of the production, use and management of energy, with a holistic view of the life cycle of the different systems, and recognise and value the most remarkable developments in the fields of energy efficiency and the rational use of energy.
- CEMT-2. Identify and describe the components of electrical systems (production, transportation, distribution, markets, procurement and consumption) and evaluate the technological solutions used in the production of electricity.
- 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 the techniques and technologies in order to improve efficiency in power systems.

Study load

Total learning time: 125h	Hours large group:	0h	0.00%
	Hours medium group:	0h	0.00%
	Hours small group:	30h	24.00%
	Guided activities:	10h	8.00%
	Self study:	85h	68.00%

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Content

<p>Introduction</p>	<p>Learning time: 4h Theory classes: 2h Self study : 2h</p>
<p>Description: Review of power system components and power system equations. Introduction to energy efficiency in power systems.</p> <p>Specific objectives: Understand the different aspects that affect power system efficiency.</p>	
<p>Technologies</p>	<p>Learning time: 60h 30m Theory classes: 14h Guided activities: 7h 30m Self study : 39h</p>
<p>Description: Technologies for improving energy efficiency.</p> <p>Related activities: Technologies</p> <p>Specific objectives: Know the technologies.</p>	
<p>Techniques</p>	<p>Learning time: 60h 30m Theory classes: 14h Guided activities: 7h 30m Self study : 39h</p>
<p>Description: Modeling and optimization techniques. Linear and non-linear programming. Heuristics methods.</p> <p>Related activities: Techniques.</p> <p>Specific objectives: Know optimization techniques.</p>	

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Planning of activities

Technologies	Hours: 7h 30m Guided activities: 7h 30m
<p>Description: Student will work in pairs in order to apply their knowledge on power system efficiency.</p> <p>Support materials: Lecture notes. Bibliography.</p> <p>Descriptions of the assignments due and their relation to the assessment: Writing report and presentation.</p> <p>Specific objectives: Analyze the improvement of efficiency in power systems and explain orally the analysis.</p>	

Techniques	Hours: 7h 30m Guided activities: 7h 30m
<p>Description: Individual activity in order to implement the optimization techniques described at lecture sessions.</p> <p>Support materials: Lecture notes. Bibliography. Optimization software.</p> <p>Descriptions of the assignments due and their relation to the assessment: Report.</p>	

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 one practical assignment (TR) that will be developed in groups. The assignment will be delivered in writing format and presented orally.

Bibliography

Basic:

Gómez Expósito, Antonio; Conejo, Antonio J.; Cañizares, Claudio. Electric energy systems : analysis and operation [on line]. Boca Raton: CRC Press, cop. 2009 [Consultation: 24/01/2017]. Available on:
<<http://site.ebrary.com/recursos.biblioteca.upc.edu/lib/upcatalunya/detail.action?docID=10240643>>. ISBN 9780849373657.

Momoh, James A. Electric power system applications of optimization. 2nd ed. Boca Raton, FL, [etc.]: CRC Press, cop. 2009. ISBN 9781420065862.