Course guide
820774 - ESEP - Efficiency in Power Systems

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2022). (Optional subject).
Academic year: 2023  ECTS Credits: 5.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: Sumper, Andreas
Others: Roberto Villafáfila Robles
         F. Javier Heredia Cervera
         Andreas Sumper

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.

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>68.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>10,0</td>
<td>8.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

Introduction

Description:
Review of power system components and power system equations. Introduction to energy efficiency in power systems.

Specific objectives:
Understand the different aspects that affect power system efficiency.

Full-or-part-time: 4h
Theory classes: 2h
Self study : 2h

Technologies

Description:
Technologies for improving energy efficiency.

Specific objectives:
Know the technologies.

Related activities:
Technologies

Full-or-part-time: 60h 30m
Theory classes: 14h
Guided activities: 7h 30m
Self study : 39h
Techniques

Description:

Specific objectives:
Know optimization techniques.

Related activities:
Techniques.

Full-or-part-time: 60h 30m
Theory classes: 14h
Guided activities: 7h 30m
Self study: 39h

ACTIVITIES

Technologies

Description:
Student will work in pairs in order to apply their knowledge on power system efficiency.

Specific objectives:
Analyze the improvement of efficiency in power systems and explain orally the analysis.

Material:
Lecture notes, Bibliography.

Delivery:
Writing report and presentation.

Full-or-part-time: 7h 30m
Guided activities: 7h 30m

Techniques

Description:
Individual activity in order to implement the optimization techniques described at lecture sessions.

Material:
Lecture notes, Bibliography, Optimization software.

Delivery:
Report.

Full-or-part-time: 7h 30m
Guided activities: 7h 30m

GRADING SYSTEM

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

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: