820129 - SEPEE - Electric Power Systems

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: JUAN JOSÉ MESAS GARCÍA
Others: JUAN JOSÉ MESAS GARCÍA, JORGE EL MARIACHET CARREÑO, JOSEP SEGARRA MULLERAT

Opening hours
Timetable: Specified by the professor during their first class, and then available in Atenea.

Prior skills
Those acquired in the subjects CALCULUS, ALGEBRA AND MULTIVARIABLE CALCULUS, NUMERICAL CALCULUS - DIFFERENTIAL EQUATIONS, ELECTRICAL SYSTEMS, CIRCUITS AND SIGNALS, ELECTRICAL MACHINES I / II, LOW AND HIGH VOLTAGE ELECTRICAL INSTALLATIONS I.

Requirements
To have passed the subjects CALCULUS, ALGEBRA AND MULTIVARIABLE CALCULUS, NUMERICAL CALCULUS - DIFFERENTIAL EQUATIONS, ELECTRICAL SYSTEMS, CIRCUITS AND SIGNALS, ELECTRICAL MACHINES I / II, LOW AND HIGH VOLTAGE ELECTRICAL INSTALLATIONS I.

Degree competences to which the subject contributes
Specific:
CEELE-23. Carry out calculations for the design of power lines and electric power transmission systems.

CEELE-24. Understand electrical power systems and their applications.

Transversal:
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

Teaching methodology
The teaching methodology used in this subject can be divided into three parts:

- Master classes: theory and problems (30%)
- Laboratory sessions (10%)
- Individual work based learning (60%)

Learning objectives of the subject
To provide knowledge on overhead line calculation and electric power systems:

- Components, structure and functions of the electric power transmission and distribution system.
- Overhead lines: Electrical parameters. Equivalent circuits. Steady state analysis. Overhead line calculation by using the per unit system (p.u.).
- Transformers: Types, connections and equivalent circuits.
- Overhead line mechanical calculation: Types of supports. Calculation of the sag. Calculation of cable stresses. Influence of temperature and other atmospheric conditions. Calculation of state change. RLAT.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>Components, structure and functions of the electric power transmission and distribution system.</td>
<td>6h 30m</td>
<td>1h 30m</td>
<td></td>
<td>5h</td>
</tr>
<tr>
<td><strong>Overhead lines 1</strong></td>
<td>Electrical parameters. Equivalent circuits.</td>
<td>17h 30m</td>
<td>4h 30m</td>
<td>3h</td>
<td>10h</td>
</tr>
<tr>
<td><strong>Overhead lines 2</strong></td>
<td>Steady state analysis.</td>
<td>35h</td>
<td></td>
<td>3h</td>
<td>20h</td>
</tr>
<tr>
<td><strong>Overhead lines 3</strong></td>
<td>Overhead line calculation by using the per unit system (p.u.).</td>
<td>11h</td>
<td>3h</td>
<td>3h</td>
<td>5h</td>
</tr>
<tr>
<td><strong>Transformers</strong></td>
<td>Types, connections and equivalent circuits.</td>
<td>35h</td>
<td>12h</td>
<td>3h</td>
<td>20h</td>
</tr>
</tbody>
</table>
The final Mark of the Subject (N_Asig) is calculated, rounded to the nearest tenth, using the formula

\[ N_{\text{Asig}} = \text{MAX} \left( 0.25 \cdot N_{\text{ExPar}} + 0.55 \cdot N_{\text{ExFin}} + 0.20 \cdot N_{\text{Prac}} ; 0.80 \cdot N_{\text{ExFin}} + 0.20 \cdot N_{\text{Prac}} \right) \]

where

- \( N_{\text{ExPar}} \) is the Midterm Exam Mark
- \( N_{\text{ExFin}} \) is the Final Exam Mark
- \( N_{\text{Prac}} \) is the Practice Mark

IMPORTANT REMARK: This subject does NOT have a Re-assessment Exam.

### Qualification system

<table>
<thead>
<tr>
<th>Load flow in power systems</th>
<th>Learning time: 32h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study : 20h</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>Overhead line mechanical calculation</th>
<th>Learning time: 13h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study : 10h</td>
</tr>
</tbody>
</table>

**Description:**
Types of supports. Calculation of the sag. Calculation of cable stresses. Influence of temperature and other atmospheric conditions. Calculation of state change. RLAT.

### Regulations for carrying out activities

- The Midterm Exam and the Final Exam are individual, in-person and written.
- In addition to writing utensils, it is only permitted to have one sheet with formulas (a single original handwritten A4 sheet) to be delivered to the professor at the end of each of the exams, and a calculator without external connectivity (no mobile phone or tablet can be used as such).
- Maximum punctuality is kindly requested.
Bibliography

Basic:


