Degree competences to which the subject contributes

Specific:
1. Carry out calculations for the design of electrical machines.

CEELE-20. Understand machine control and electric drives and their applications.

Transversal:
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Teaching methodology

Expositive methodology for theory classes.
PBL for exercises classes.
Normalized test on laboratory classes.

Learning objectives of the subject

Electrical machines analysis feeds with industrial grid or ideal electronic converter.
Non conventional machines analysis.
Transient analysis of AC machines
Introduction to design of electrical machines

Study load

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Learning time: 31h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 10h</td>
<td></td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
<td></td>
</tr>
<tr>
<td>Self study : 19h</td>
<td></td>
</tr>
</tbody>
</table>

### Synchronous machines: Generator operation

#### Description:

#### Related activities:
- Test of generator. No load test. Short circuit test.

### Synchronous machine: motor operation

#### Description:

#### Related activities:
- Grid Synchronization of synchronous generator. Working as a motor. Constant power characteristics.

### Non conventional machines

#### Description:

#### Related activities:
- Step motor test.
- Asynchronous linear motor test
# Direct current machines

<table>
<thead>
<tr>
<th>Learning time: 16h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 9h</td>
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</tbody>
</table>

**Description:**

**Related activities:**
- DC generator test
- DC motor test

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# Transients and Dynamics of electrical machines

<table>
<thead>
<tr>
<th>Learning time: 17h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 5h</td>
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<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 10h</td>
</tr>
</tbody>
</table>

**Description:**
3-2 transformations. Rotating references. FLux, voltage, power and torque expressions. Equivalent circuits for transient analysis. Case study.

**Related activities:**

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# Design of electrical machines

<table>
<thead>
<tr>
<th>Learning time: 24h</th>
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<tbody>
<tr>
<td>Theory classes: 5h</td>
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<tr>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

**Description:**
General expressions for torque. Standards. Scale laws. FE applications for analysis and design of electrical machines.

**Related activities:**
- FE analysis of electrical machine

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# Qualification system

Final test: 20%
Laboratory: 20%
Homework exercises + class exercises: 15%
Middle term exam: 20 + 20%
Regulations for carrying out activities

Scientific calculator
1 sheet with expressions. No reexam.

Bibliography

Basic:


Complementary: