Degree competences to which the subject contributes

Specific:
1. ELE: Ability to calculate and design electrical machines.

Teaching methodology

In the lecture sessions, the lecturer presents the subject content. He/she covers the various concepts, explains what documentation will be used and assigns work.

In the face-to-face applied sessions, groups of three students present the results of their completed assignments. The lecturer decides which students will participate in each of these sessions.

Independent learning enables students to gain an understanding of each of the concepts covered by the lecturer. This type of learning also includes the completion of assignments.

Group work, done in three-person teams, includes preparation for practicals and the writing of post-practical reports.

Learning objectives of the subject

This subject introduces students to the operation, construction, application and selection principles of electric machines (both static and rotating), as well as the design of basic parts that are common to all such machines. Students will learn to use the parameters that govern the various types of machines and interpret their characteristic curves. They will use commercial catalogues and rated quantities to determine the performance of different machines and select the most appropriate one. They will also learn to interpret and use graphic methods, recommended by international standards, for construction, use and start-up tests.

Students will learn to solve problems related to the behaviour of electric machines (generators, transformers and engines) both analytically and graphically, paying special attention to the order of magnitude and the units used in industry. They will use construction plans and diagrams to better understand the operation and configuration of the various circuits (magnetic, electric, dialectic, etc.) and their topology.
### Study load

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<thead>
<tr>
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<th>Total learning time: 150h</th>
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<tbody>
<tr>
<td></td>
<td>Hours large group:</td>
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<tr>
<td></td>
<td>30h</td>
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<td>Hours medium group:</td>
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<td>Hours small group:</td>
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<td>15h</td>
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<td>Guided activities:</td>
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<td>Self study:</td>
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<td>90h</td>
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### TOPIC 1: ASYNCHRONOUS ALTERNATING-CURRENT MACHINES

**Description:**
- Asynchronous (induction) motors.
- Moment of a motor.
- Equivalent circuit of asynchronous motors.
- Circle diagram.
- Start-up of asynchronous motors.
- Speed regulation.
- Single-phase motors.
- Special motors.
- Additional topics.

**Related activities:**
- Three sessions.
- Testing of single-phase asynchronous motors to obtain their characteristic parameters and equivalent circuit.
- Testing of three-phase asynchronous motors to obtain their characteristic parameters and equivalent circuit.
- Start-up of three-phase asynchronous motors: direct, autotransformer, static star-delta.

**Learning time:** 44h
- Theory classes: 27h
- Practical classes: 8h
- Laboratory classes: 6h
- Guided activities: 3h

### TOPIC 4: DIRECT-CURRENT MACHINES

**Description:**
- Construction and principles of direct-current machines.
- Armature reaction and commutation.
- Direct-current motors.
- Additional topics.

**Laboratory sessions**
- Two sessions.
- Testing of direct-current motors and generators to obtain their characteristic parameters and equivalent circuit.

**Learning time:** 21h
- Theory classes: 12h
- Practical classes: 4h
- Laboratory classes: 4h
- Guided activities: 1h
Qualification system

First Exam (Theory) - 25%
First Exam (Lab) - 15%
Second Exam (Theory) - 25%
Second Exam (Lab) - 20%
Work in Laboratory - 15%

Bibliography

Basic:


Complementary: