Degree competences to which the subject contributes

Specific:
6. CE19. Ability to calculate design electrical machines.

Transversal:
1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.
2. 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
- In the theory classes, be exposed and develop the theoretical foundations of programmed materials. They consist of theoretical explanations complemented by activities to encourage participation, discussion and critical analysis by students.
- The kinds of problems will arise and solve exercises for the subject under discussion. Students should meet individually or in groups, indicating problems.
- Within hours of laboratory practice the students will be required and submit the relevant report of the activity along with appropriate calculations and critical considerations.
- Group work will be undertaken during the course of a specific topic related to the subject.

Learning objectives of the subject
- Provide the basics of transformers and rotating electrical machines.
- Know the various constituents and key technological aspects of transformers and rotating electrical machines.
- Present the different types of transformers and their applications.
- Analyze the performance of transformers (single and three phase) from the equivalent circuit.
- To study the electromechanical conversion of energy and implement their primary relationships in machinery and electrical devices.
- Present the main uses of the synchronous machine as a motor and a generator.
- Study the constructive peculiarities of the synchronous machine and its operation principle.
- Analyze the behavior of the synchronous machine in steady state using its equivalent circuit.
- Clearly identify what is meant by the parameters of the plate in electrical machines.
- Plan and implement appropriate laboratory testing electrical machines.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group</th>
<th>Hours medium group</th>
<th>Hours small group</th>
<th>Guided activities</th>
<th>Self study</th>
<th>Study load</th>
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</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 150h</td>
<td>45h</td>
<td>0h</td>
<td>15h</td>
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# Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time</th>
<th>Description</th>
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</table>
| **1.- Principes of electric machinery**                                | 31h          | Theory classes: 9h  
Learning time: 40h  
Laboratory classes: 4h  
Self study : 18h |
| **2.- Transformers**                                                   | 26h          | Theory classes: 8h  
Laboratory classes: 4h  
Self study : 24h |
| **3.- Electromechanical Conversion of energy**                         | 13h          | Theory classes: 4h  
Laboratory classes: 1h  
Self study : 8h |
| **4.- Technological principles of the rotating electric machinery**    |              | Description:  
Air gap magnetic field.  
Electromotive forces induced in the windings.  
Aspects of construction and operation of electrical machines. |
5.- Synchronous Electric Machines

Learning time: 40h
- Theory classes: 12h
- Laboratory classes: 4h
- Self study: 24h

Description:
5.2.- Equivalent circuit. Determination of circuit parameters.
5.3.- The synchronous generator load. Methods predetermination of excitation load.
5.4.- Synchronous Generator: feeding a load operation isolated and connected to the network.
5.5.- The synchronous machine as a motor. Curves.
5.6.- Magnet synchronous motor.
5.7.- Synchronous machine with salient poles.

Qualification system
- First test carried out during the course (30%).
- Test conducted at the end of the course (45%).
- Realization laboratory practice (25%).

Regulations for carrying out activities
- The written tests are face and individual.
- In classes of problems and/or laboratory practices will be assessed, where appropriate, the prior work with the presentation of results of the activity.

Bibliography

Basic:

Complementary: