820140 - EDEE - Electric Drives

Degree competences to which the subject contributes

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

CEELE-26. Understand automatic regulation and control techniques and their application to industrial automation.

Transversal:
1. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology

The course uses master classes by 45%, individual work by 25%, work in groups (cooperative or not) by 30%.

Learning objectives of the subject

Understanding the behaviour of the variable-speed electric drives, under the point of view of a whole set made up of power electronics, electric machines and mechanical loads.

Study load

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

## 1. Power Electronics and Drives

**Learning time:** 15h  
Theory classes: 4h  
Laboratory classes: 1h  
Self study: 10h

**Description:** Classification and basic characteristics of electrical drives.  

**Specific objectives:** Power electronics for electric drives. Types of electric drives, performance characteristics. Variable speed operation. Four-quadrant operation.

## 2. Induction Three-Phase Asynchronous Motor in Steady State

**Learning time:** 19h 40m  
Theory classes: 7h  
Laboratory classes: 1h  
Self study: 11h 40m

**Description:** Application of the steady state induction motor model to the starting process and to variable-speed operation.  


## 3. Synchronous Motors

**Learning time:** 17h 50m  
Theory classes: 7h  
Laboratory classes: 1h  
Self study: 9h 50m

**Description:** Variable-speed drives based on synchronous motor.  

**Specific objectives:** Classification and equivalent circuits. Voltage and current-fed schemes. Self-commutated systems. Cycloconverters application.
### 4. DYNAMIC MODELLING OF AC MACHINES

**Description:**
Dynamic models of AC machines.

**Specific objectives:**
- Introduction of space-phasors.
- Three-phase to two-phase transformation.
- Power balance and electromechanical torque.
- Deduction of steady state equivalent circuit.
- Applications.

**Learning time:** 23h 20m
- Theory classes: 9h
- Laboratory classes: 1h
- Self study: 13h 20m

### 5. NON VECTORIAL CONTROL OF AC MACHINES

**Description:**
Control techniques for AC machines.

**Specific objectives:**
- Classification of control techniques.
- Scalar control.
- Vector control.
- Applications for the asynchronous and the synchronous machines.

**Learning time:** 12h 20m
- Theory classes: 3h
- Laboratory classes: 1h
- Self study: 8h 20m

### 6. VECTORIAL CONTROL ON ALTERN CURRENT MACHINES

**Description:**
content english

**Learning time:** 23h 20m
- Theory classes: 9h
- Laboratory classes: 1h
- Self study: 13h 20m

### 7. NON CONVENTIONAL ELECTRIC MACHINES

**Description:**
content english

**Learning time:** 8h 30m
- Theory classes: 5h
- Self study: 3h 30m
Qualification system

The evaluation will be conducted through the assessment by the teacher, with the following weights assigned to evaluated activities:
Team Work: 40%, laboratory practice: 20% Final exam: 40%.

Bibliography

Basic: