820140 - EDEE - Electric Drives

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6

Teaching languages: Catalan

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering

Teaching staff
Coordinator: Fillet Castella, Sergi

Requirements
MÀQUINES ELÈCTRICHES II - Prerequisite

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

## 1. POWER ELECTRÓNICS AND DRIVES.

**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.

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

## 2. INDUCTION THREE-PHASE ASYNCHRONOUS MOTOR IN STEADY STATE.

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

**Specific objectives:**
- Equivalent circuits.
- Motor starting.
- Variable-speed operation.
- Variable frequency-fed motor.
- Constant torque and constant speed operation.
- Current-fed motor.

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

## 3. SYNCHRONOUS-MOTORS.

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

**Specific objectives:**
- Classification and equivalent circuits.
- Voltage and current-fed schemes.
- Self-commutated systems.
- Cycloconverters application.

**Learning time:** 17h 50m
- Theory classes: 7h
- Laboratory classes: 1h
- Self study: 9h 50m
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Learning Time</th>
<th>Description</th>
<th>Specific Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. NON VECTORIAL CONTROL OF AC MACHINES</td>
<td>12h 20m</td>
<td>Description: Control techniques for ac machines.</td>
<td>Specific objectives: Classification of control techniques. Scalar control. Vector control. Applications for the asynchronous and the synchronous machines.</td>
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<tr>
<td>6. VECTORIAL CONTROL ON ALTERN CURRENT MACHINES</td>
<td>23h 20m</td>
<td>Description: content english</td>
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<td>7. NON CONVENTIONAL ELECTRIC MACHINES</td>
<td>8h 30m</td>
<td>Description: content english</td>
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</table>
The evaluation will be conducted through the assessment by the teacher, with the following weights assigned to evaluated activities:
Team Work: 30%, laboratory practice: 30% Final exam: 40%.

Bibliography

Basic: