820140 - EDEE - Electric Drives

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2017
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

Teaching staff
Coordinator: Fillet Castella, Sergi

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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</thead>
<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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</tbody>
</table>
# Content

<table>
<thead>
<tr>
<th>1. POWER ELECTRÒNICS AND DRIVES.</th>
<th>Learning time: 15h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Laboratory classes: 1h</td>
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<tr>
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<td>Self study : 10h</td>
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</tbody>
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**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.

<table>
<thead>
<tr>
<th>2. INDUCTION THREE-PHASE ASYNCHRONOUS MOTOR IN STEADY STATE.</th>
<th>Learning time: 19h 40m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h</td>
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<tr>
<td></td>
<td>Self study : 11h 40m</td>
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</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>3. SYNCHRONOUS MOTORS.</th>
<th>Learning time: 17h 50m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
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<tr>
<td></td>
<td>Laboratory classes: 1h</td>
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<tr>
<td></td>
<td>Self study : 9h 50m</td>
</tr>
</tbody>
</table>

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

## 6. VECTORIAL CONTROL ON ALTERN CURRENT MACHINES

### Description:
content english

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

## 7. NON CONVENTIONAL ELECTRIC MACHINES

### Description:
content english

### Learning time:
- 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:

