

## 820140 - EDEE - Electric Drives

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering  
 Teaching unit: 709 - EE - Department of Electrical Engineering  
 Academic year: 2018  
 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

Total learning time: 150h	Hours large group:	45h	30.00%
	Hours medium group:	0h	0.00%
	Hours small group:	15h	10.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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### Content

<p>1. POWER ELECTRÒNICS AND DRIVES.</p>	<p>Learning time: 15h Theory classes: 4h Laboratory classes: 1h Self study : 10h</p>
<p>Description: Classification and basic characteristics of electrical drives.</p> <p>Specific objectives: Power electronics for electric drives. Types of electric drives. performance characteristics. Variable speed operation. Four-quadrant operation.</p>	
<p>2. INDUCTION THREE-PHASE ASYNCRONOUS MOTOR IN STEADY STATE.</p>	<p>Learning time: 19h 40m Theory classes: 7h Laboratory classes: 1h Self study : 11h 40m</p>
<p>Description: Application of the steady state induction motor model to the starting process and to variable-speed operation.</p> <p>Specific objectives: Equivalent circuits. Motor starting. Variable-speed operation. Variable frequency-fed motor. Constant torque and constant speed operation. Current-fed motor.</p>	
<p>3. SYNCHRONOUS MOTORS.</p>	<p>Learning time: 17h 50m Theory classes: 7h Laboratory classes: 1h Self study : 9h 50m</p>
<p>Description: Variable-speed drives based on synchronous motor.</p> <p>Specific objectives: Classification and equivalent circuits. Voltage and current-fed schemes. Self-commutated systems. Cycloconvertes application.</p>	

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<p>4. DYNAMIC MODELLING OF AC MACHINES.</p>	<p>Learning time: 23h 20m Theory classes: 9h Laboratory classes: 1h Self study : 13h 20m</p>
<p>Description: Dynamic models of AC machines.</p> <p>Specific objectives: Introduction of space-phasors. Three-phase to two-phase transformation. Power balance and electromechanical torque. Deduction of steady state equivalent circuit. Applications.</p>	
<p>5. NON VECTORIAL CONTROL OF AC MACHINES.</p>	<p>Learning time: 12h 20m Theory classes: 3h Laboratory classes: 1h Self study : 8h 20m</p>
<p>Description: Control techniques for ac machines.</p> <p>Specific objectives: Classification of control techniques. Scalar control. Vector control. Applications for the asynchronous and the synchronous machines.</p>	
<p>6. VECTORIAL CONTROL ON ALTERN CURRENT MACHINES</p>	<p>Learning time: 23h 20m Theory classes: 9h Laboratory classes: 1h Self study : 13h 20m</p>
<p>Description: content english</p>	
<p>7. NON CONVENTIONAL ELECTRIC MACHINES</p>	<p>Learning time: 8h 30m Theory classes: 5h Self study : 3h 30m</p>
<p>Description: content english</p>	

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### 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:

Mohan, Ned. Advanced electric drives: analysis, control, and modeling using MATLAB / Simulink. 2014. Wiley, ISBN 9781118485484.

El-Sharkawi, M. A. Fundamentals of electric drives. Pacific Grove, CA: Brooks/Cole, 2000. ISBN 0534952224.

Dubey, G. K. Fundamentals of electric drives. 2<sup>a</sup> ed. Baupur: Alpha Science International, 2001. ISBN 9781842650837.

Boldea I., Nasar S. A. Electric drives. 2nd ed. Boca Raton [etc.]: CRC Press, 2006. ISBN 9780849342201.