

Course guide

820140 - EDEE - Electric Drives

Last modified: 02/10/2025

Unit in charge: Barcelona East School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: SERGI FILLET CASTELLA

Others: Primer quadrimestre:
SERGI FILLET CASTELLA - Grup: T11, Grup: T12, Grup: T13
GUILLERMO YESTE MAYORAL - Grup: T11, Grup: T13

PRIOR SKILLS

Advanced electrical Machines course

REQUIREMENTS

MÀQUINES ELÈCTRIQUES II - Prerequisit

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 40%, individual work by 30%, 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

| Type | Hours | Percentage |
|-------------------|-------|------------|
| Self study | 90,0 | 60.00 |
| Hours small group | 15,0 | 10.00 |
| Hours large group | 45,0 | 30.00 |

Total learning time: 150 h

CONTENTS

1. POWER ELECTRONICS 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.

Full-or-part-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.

Full-or-part-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. Cycloconvertes application.

Full-or-part-time: 17h 50m

Theory classes: 7h

Laboratory classes: 1h

Self study : 9h 50m

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.

Full-or-part-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.

Full-or-part-time: 12h 20m

Theory classes: 3h

Laboratory classes: 1h

Self study : 8h 20m

6. VECTORIAL CONTROL ON ALTERNATE CURRENT MACHINES

Description:

content english

Full-or-part-time: 23h 20m

Theory classes: 9h

Laboratory classes: 1h

Self study : 13h 20m

7. NON CONVENTIONAL ELECTRIC MACHINES

Description:

content english

Related competencies :

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

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

06 URI N3. 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.

Full-or-part-time: 8h 30m

Theory classes: 5h

Self study : 3h 30m



GRADING SYSTEM

The evaluation will be conducted through the assessment by the teacher, with the following weights assigned to evaluated activities:
Team Work: 20%, laboratory practice: 30% Continuous assessment controls to be carried out in class 5x10%.

BIBLIOGRAPHY

Basic:

- Mohan, Ned. Advanced electric drives: analysis, control, and modeling using MATLAB / Simulink. 2014. Wiley, ISBN 9781118485484.
- El-Sharkawi, Mohamed A. Fundamentals of electric drives. Pacific Grove, CA: Brooks/Cole, 2000. ISBN 0534952224.
- Dubey, G. K. Fundamentals of electric drives. 2^a 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.