Course guide
820140 - EDEE - Electric Drives

Last modified: 08/08/2024

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: 2024 **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: T12, 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 INFORMATI0N 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 ELECTRÒNICS AND DRIVES.

Description:
Classification and basic characteristics of electrical drives.

Specific objectives:
Power electronics for electric drives. Tipes 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 ASYNCRONOUS 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 ALTERN 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 INFORMATI0N 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: 25%, laboratory practice: 25% Final exam: 50%.

EXAMINATION RULES.

The final test will have three parts, linked to the different types of activities carried out during the course.
Issues related to group work: 20%
Issues relatee to lab sessions: 20%
Questions related to the course theory: 60%

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. 2ª 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.