Last update: 08-05-2019

820756 - ELA - Advanced Electrical Engineering

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering

Teaching unit: 709 - EE - Department of Electrical Engineering

Academic year: 2019

Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: Bergas Jane, Joan Gabriel

Others: Bergas Jane, Joan Gabriel

Opening hours

Timetable: Monday from 10:30 to 13:00
Monday from 19:00 to 21:00
Wednesday from 10:30 to 13:00

Prior skills

Previous knowledge in Circuit Theory and Electrical Engineering

Requirements

No prerequisites

Degree competences to which the subject contributes

Transversal:

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

Teaching methodology

The course development includes the following teaching methods:
- Master class (EXP): theory exposition and Slides-based lecturing.
- Oriented individual works (TD): individual works of reduced complexity or extensión. The acquired knowledge will be applied in these works, and the results will be presented. Their ellaboration will start in the classroom (with the teacher guidance) and will end out of the classroom.
- Evaluation activities (EV). Some problems will be proposed as assignement.

In parallel, the students will have to follow the non-contact part of the course (readings and exercises).
During the semester the students will work, in teams of 3 or 4 people, on a tutored project about a specific energy topic, and will write a technical report (or a general scope article, depending on the subject) on that topic, that will defend before their tutor.

Learning objectives of the subject

To provide students with the advanced tools and techniques in the field of electrical engineering.

Last update: 08-05-2019

820756 - ELA - Advanced Electrical Engineering

Study load

Total learning time: 125h	Hours large group:	0h	0.00%
	Hours medium group:	0h	0.00%
	Hours small group:	30h	24.00%
	Guided activities:	10h	8.00%
	Self study:	85h	68.00%

Last update: 08-05-2019

820756 - ELA - Advanced Electrical Engineering

Content

Transient analisys of electrical circuits.

Learning time: 44h

Laboratory classes: 9h
Guided activities: 5h
Self study : 30h

Description:
This content is to give students with the necessary tools for the obtantion of the differential equations that describe a circuit.

Related activities:
A1.- Simulation with Simulink of the transient response of a DC Motor.

Specific objectives:
.- State space equations of electrical circuits.
.- Transfer functions of electrical cirtuits.

Instant power theory

Learning time: 33h

Laboratory classes: 8h
Guided activities: 5h
Self study : 20h

Description:
This content is to give students a brief overview on Instant Power Theory and its applications.

Phase-lock loop (PLL's): single-phase and three-phas in umbalanced systems.

Learning time: 33h

Laboratory classes: 8h
Guided activities: 5h
Self study : 20h

Description:
Nowadays, PLL's are the most used technique to synchronize Active Front End (AFE's) with main's voltages. This content will give an overview on PLL's, either single-phase or three-phase (in umbalances systems and with voltage sags).

Related activities:
A2. Simulink simulation of a single-phase PLL.
A3. Simulink simulation of a three-phas PLL in a system with an umbalanced voltage sag.

Specific objectives:
.- SRF-PLL (Synchronous reference frame PLL).
.- DSRF-PLL (Doble Synchronous reference frame PLL).
.- Single-phase PLL (SOGI, ANF, others...)

Last update: 08-05-2019

820756 - ELA - Advanced Electrical Engineering

Matrix transforms: Park' Transform	Learning time: 15h Laboratory classes: 5h Self study : 10h

Description:
In this content, the Matrix transform will be introduced and applied to a particular case: the transient modelling of a three-phase grid.

Related activities:
A4. Simulink modelization of a three-phase grid.

Planning of activities

A1.- Simulation with Simulink of the transient response of a DC Motor.	Hours: 7h Laboratory classes: 2h Guided activities: 5h
A2. Simulink simulation of a single-phase PLL.	Hours: 9h 30m Laboratory classes: 2h Self study: 2h 30m Guided activities: 5h
A3. Simulink simulation of a three-phas PLL in a system with an umbalanced voltage sag.	Hours: 18h Laboratory classes: 3h Self study: 5h Guided activities: 10h
A4. Simulink modelization of a three-phase grid.	Hours: 8h Laboratory classes: 3h Self study: 5h

Qualification system

Written test (final exam) (PE): 50 %
Oriented individual works (TD): 40 %
Oral presentations (PO): 10%

Last update: 08-05-2019

820756 - ELA - Advanced Electrical Engineering

Bibliography

Basic:

Novotny, D. W; Lipo, T. A. Vector control and dynamics of AC drives. Oxford : New York: Clarendon Press ; Oxford University Press, 1996. ISBN 0198564392.

Chua, Leon O; Desoer, Charles A; Kuh, Ernest S. Linear and nonlinear circuits. New York [etc.]: McGraw-Hill, cop. 1987. ISBN 9780070108981.

Complementary:

Trzynadlowski, Andrzej M. Control of induction motors. San Diego, CA [etc.]: Academic Press, cop. 2001. ISBN 0127015108.