30359 - Electronic Power Supply Fonts

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	438 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS	6.0
Course	4
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process designed for this subject is based on the following:

* The teaching process will involve three main levels: lectures, laboratory problems and, active student participation.
* In the lectures the theoretical basis of electronic power supplies will be exposed.
* In the classes of problems the students will develop worked-out examples
* The laboratory practices will be developed in small groups where students perform computer simulations and assembly of electronic power supplies.

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5.2.Learning activities

The program offered to the student aims to help him achieving the expected results and includes the following activities ...

CLASS WORK: 2.4 ECTS (60 hours)

1) Theoretical classes (30 hours).

Keynote sessions presentation of theoretical contents. The concepts and fundamentals of electronic power systems, illustrating them with examples will be presented. The student participation is demanded through questions

2) problem solving classes (15 hours).

Problems and cases involving students, coordinated at all times with the theoretical contents will be developed. Students are encouraged to work the problems previously.

3) Laboratory practicum (15 hours).

It will consist both assembly and computer simulation of electronic power supplies. The student will have a script for each practice.

TAKE-HOME WORK: 3.6 ECTS (90 hours)

4) Student assignements (24 hours).

They are activities that the student will perform alone or in groups and that the teacher will propose throughout the

teaching period. In order to assess the progressive acquisition of knowledge, they will be proposed resolution of a sheet of short questions. The developed work is associated with the laboratory practicum.

5) Study (62 hours).

The ongoing work of the student will be encouraged by the homogeneous distribution throughout the semester of the various learning activities.

6) Evaluation tests (4 hours).

In addition to the assessment function, it is also a learning tool with which the student checks the degree of understanding and assimilation reached.

5.3.Program

The contents developed in the classroom are as follows:

* Introduction to power supplies.
* Linear power supplies. Integrated regulators.
* Switching Power supplies: generalities.
* DC-DC converter for switching power supplies.
* Design of magnetic components for switching power supplies.
* Obtaining transfer functions and control loop simulation.
* Control of switching power supplies. Specific integrated circuits.
* Auxiliaries. Applicable Safety and EMI estandards.

The contents developed in the weekly homework are::

1. Elements of a linear power sypply.
2. Averaged and Root Mean Squared values.
3. Linear / switched power supplies.
4. Kirchhoff Laws with averaged values.
5. Parseval and graphic calculation.
6. Regulators Types I, II and III.
7. Averaged models.
8. Buck Regulador SG3524.
9. Magnetic Componentes.
10. Magnetic Componentes. 2.
11. Transfer Functions in MCC.
12. Voltage ratio in MCD.
13. Transfer Functions in MCD.
14. Isolated feedback.

15. Isolated feedback 2.
16. Voltage ratio in CPM_MCC.
17. Transfer Functions in CPM_MCC
18. Voltage ratio in CPM_MCD.
19. MCC-MCD limit.
20. LISN circuit.
21. CM and DM disturbances.
22. X2 and Y2 capacitors performance.
23. X2 and Y2 rating.
24. Atenuación required in CM
25. Atenuación required in CM-2.
26. SmartCtrl_Buck pract 4.
27. SmartCtrl_Flyback pract 6.

The contents developed in the problems solving are:

1. Problem 2.1 Analysis of the effect of the magnetizing inductance.
2. Problem 2.2 Analysis of the effect of the leakage inductance.
3. Problem 2.4 Design of inductances.
4. Problem 2.5 Calculation of the filter coil in a Buck converter.
5. Problem 2.9 5skin effect.
6. Problem 2.13 Calculation of the life time of an electrolytic capacitor.
7. Problem 6.1 Design of a Buck converter.
8. Problema 6.14 Design a boost converter.
9. Problem 6.25 Design of a flyback converter.
10. Problema 6.26 Design a Forward Converter.
11. Problema 6.29 Design of a two transistors Forward converter.
12. Problem 6.35 Design of a full-bridge converter.
13. Problem 6.41 Design of a cuasiresonant ZVS Buck converter.
14. Problem 6.45 Transfer functions of a buck converter in continuous mode and duty cycle control.

5.4.Planning and scheduling

Lecture schedule and assignements

Lectures and problem classes and practice sessions held in the laboratory are according to schedule set by the accademic authorities (schedules available on their website). The other activities will be planned depending on the number of students and will be announced in good time.

The weekly breakdown is as follows

Week 1:

* Introduction to power supplies.
* Line sources. Integrated regulators.

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* Weekly work due 1 and 2

Week 2:

* Introduction to power supplies.
* Line sources. Integrated regulators.
* Problems linear sources
* Weekly work due 3 and 4
* 1st Lab practice, group A

Week 3:

* Switching Power: generalities.
* DC-DC converter for switching power supplies.
* Student presentation problem 1
* Weekly work due 5 and 6
* 1st Lab practice, group B

Week 4:

* Switching Power: generalities.
* DC-DC converter for switching power supplies.
* Student presentation problem 2
* Weekly work due 7 and 8
* 2st Lab practice, group A

Week 5:

* Design of magnetic components for switching power supplies.
* Student presentation problem 3
* Weekly work due 9 and 10
* 2st Lab practice, group B

Week 6:

* Design of magnetic components for switching power supplies.
* Obtaining transfer functions and control loop simulation.
* Student presentation problems 4 and 5
* Weekly work due 11 and 12

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* 3rd Lab practice, group A

Week 7:

* Design of practice 4
* Obtaining transfer functions and control loop simulation.
* Student presentation problem 6
* Weekly work due 13 and 14
* 3rd Lab practice, group B

Week 8:

* Design of practice 4
* Obtaining transfer functions and control loop simulation.
* Control of switching power supplies. Specific integrated circuits.
* Student presentation problem 7
* Weekly work due 15 and 16
* 4th Lab practice, group A

Week 9:

* Design of practice 5
* Student presentation problem 8
* Weekly work due 17 and 18
* 4th Lab practice, group B

Week 10:

* Design of practice 5
* Student presentation of problems 9, 10 and 11
* Weekly work due 19 and 20
* 5th Lab practice, group A

Week 11:

* Auxiliaries. Applicable regulations.
* Student presentation problem 12
* Weekly work due 21 and 22
* 5th Lab practice, group B

Week 12:

* Auxiliaries. Mandatory estandards.
* Make survey
* Student presentation problem 13
* Weekly work due 23 and 24
* 6th Lab practice, group A

Week 13:

* Auxiliaries. Madatory estandards.
* Make survey
* Student presentation problem 14
* Weekly work due 25 and 26
* 6th Lab practice, group B

Week 14:

* Auxiliaries. Mandatory estandards.
* Weekly work due 27

* Recovery of lab practices

5.5.Bibliography and recomended resources