UAB
Universitat Autònoma de Barcelona

Electronic Power Circuits

2026/2027

Code: 102731
Credits: 6

Degree programme	Type	Course
Electronic Engineering for Telecommunication	OB	3

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the end of the document.

Prerequisites

Students who register for the subject should have met the following requirements:

1. Mathematical treatment of sinusoidal, triangular and square wave signals (including Fourier decomposition).

2. Know and correctly apply the Kirchoff laws of electrical circuit analysis.

3. Basic notions of energy transmission in AC and DC mode.

4. Basic knowledge of the physics of semiconductors. Diodes and transistors MOSFET

5. Interest in electricity and its management. 6. Fundamentals of magnetism

Objectives

The objectives of the subject are the following:
1. Understand the methodology of power circuit analysis based

on the identification of the current in each component at each instant of time.
2. Know the basic characteristics of the two modes of transport of electrical

energy: AC and DC.
3. Achieve minimum competence in the analysis of the flow of electrical

energy in a power system.
4. Know the mode of operation of the different semiconductor power

devices: MOS transistors, diodes, BJTs, thyristors and IGBTs.
5. Learn the static and dynamic characteristics of each of the power

semiconductor devices and be able to select the appropriate component in each application.
6. Understand the electrical and technological characteristics of passive elements

(resistors, capacitors and coils) and know their function in a power circuit.
7. Analyze the basic topologies of AC / DC and DC / DC converters.
8. Know the operation and utility of the transformers.
9. Achieve minimum skills in heat treatment circuits and power system.

Learning outcomes

1. Design analogue and digital electronic circuits: filters.
2. Design electrical energy power supply and conversion circuits for telecommunications and computing applications.
3. Design transformers and inductors for energy converters based on simple analytical models.
4. Consider heat dissipation in the design of power converters.
5. Optimize the final features of the design of a circuit or system by choosing the appropriate technology for implementation.
6. Develop critical thinking and reasoning.
7. Develop the capacity for analysis and synthesis.
8. Develop scientific thinking.
9. Develop systemic thinking.
10. Work autonomously.
11. Develop independent learning strategies.
12. Manage available time and resources. Work in an organised manner.
13. Prevent and solve problems.
14. Make one's own decisions.
15. Adapt to unforeseen situations.
16. Work in complex or uncertain surroundings and with limited resources.
17. Critically evaluate the work done.
18. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
19. Efficiently use ICT for the communication and transmission of ideas and results.
20. Maintain a proactive and dynamic attitude with regard to one's own professional career, personal growth and continuing education. Have the will to overcome difficulties.
21. Develop curiosity and creativity.
22. Generate innovative and competitive proposals in professional activity.

Contents

1. Introduction to power systems

2. Rectification AC / DC recharge with diodes

3. Rectification AC / DC with thyristors (phase control)

4. Direct DC / DC conversion with MOS transistors and diodes

5. DC / DC conversion with transformers

6. Power semiconductor devices

7. Design of passive power elements (L, R and C)

8. Thermal management of power systems and aspects related to the encapsulation of passive and active components

9. DC / AC inversion

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Semiconductor devices analysis	22	0.88	4, 5, 6, 7, 9, 10, 12, 14, 18, 20, 21
Class. Fundamental concepts	45	1.8	1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 20, 21
Lab sessions	12	0.48	1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 18, 20, 21
Analysis of different power circuits	35	1.4	1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 14, 15, 16, 18, 20, 21, 22
Resolution of practical cases of power systems	15	0.6	1, 2, 3, 6, 7, 8, 10, 12, 18, 20

The evaluation of the subject will include:

1. Partial exams (one of rectification and one of conversion and design of inducers)

2. Laboratory practices

3. Individual or small group exercises

Eventually, and depending on the notes given in the three items to evaluate, there may be slight modifications of the weight of each item in the final grade to correct correct possible errors in the difficulty of an exam, etc. It is necessary to pass the 'partial exams. In case of not doing so, a second opportunity will be available at the end of the course.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Reports of the lab sessions	25	8	0.32	1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 18, 20
Exams	60	4	0.16	1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 16, 18
Reports of the exercises	15	9	0.36	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

The evaluation of the subject will include:

1. Two partial exams (one to evaluate the rectification contents and the other to evaluate DC/DC converters)

2. Laboratory practices including PSPICE simulation

Eventually, and depending on the grades given in the three items to be evaluated, there may be slight modifications of the weight of each item in the final grade to correct correct possible errors in the difficulty of an exam, etc. It is necessary to pass the partial exam. In case of not doing so, a second opportunity will be available at the end of the course.

Bibliography

1. D.W. Hart. Electrónica de Potencia. Prentince Hall 2001

2. Kassakian et al. Principles of Power ELectronics. Addison-Wesley 1991

3. Mohan et al. Power Electronics: Converters, Application and Design. Wiley 1989

4. J.L. Muñoz-Sáez et al. Sistemas de Alimentación Conmutados. Paraninfo 1996

5. Professor notes

Software

It is mandatory to have one of the available circuit simulators (PSPICE, LTSPICE, etc.).

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	320	Catalan	second	afternoon

			semester	
(PAUL) Classroom practices	321	Catalan	second semester	afternoon
(PLAB) Practical laboratories	321	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	322	Catalan	second semester	afternoon
(PLAB) Practical laboratories	322	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	323	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	324	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	325	Catalan/Spanish	second semester	morning-mixed