Course guide
330252 - DESP - Electronic Design Power Systems

Last modified: 25/04/2024

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2016). (Optional subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: INMACULADA MARTINEZ TEIXIDOR

Others: Delis Ramos, Francisco Manuel
Pregonas Sarra, Jaume

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Applied knowledge of electronic instrumentation.
2. Ability to design power electronic systems.
3. Knowledge to develop modeling and simulation of systems.

Transversal:
4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
5. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
6. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

The hours of directed learning that are carried out in a medium group, consist, on the one hand, of giving expository classes in which the teacher makes a brief presentation to introduce the general learning objectives related to the basic concepts of the subject, which are combined with Cooperative learning techniques, in which the resolution of practical exercises is proposed, from which it is tried to motivate and involve the students so that they participate actively in their learning. Students can access all the support material via ATENEA.
The hours of directed learning that are carried out in a small group, consist of carrying out laboratory practices, which are done in groups, and allow developing design skills and elaboration of a Power Systems project, as well as starting the student body in defense public of your projects.
In general, after each session, tasks are proposed outside the classroom, which must be worked either individually or in groups and which are the basis of autonomous learning. Other hours of autonomous learning must also be considered, such as those devoted to oriented reading, solving the proposed problems or self-learning questionnaires for the different contents through the virtual campus ATENEA.

LEARNING OBJECTIVES OF THE SUBJECT

Upon completion of the Electronic Design: Power Systems course, the student must be able to:

- Know how to analyze circuits related to electronic power systems.
- Know how to design circuits corresponding to electronic power systems.
- Know how to carry out practical applications in motor speed regulation.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Title content 1: CONTINUOUS-CONTINUOUS CONVERTERS

Description:
1.1. Introduction. Classification.
1.2. Basic structures.
1.3. Applications.

Specific objectives:
- Understand the fundamental principles of continuous-continuous converters.
- Know and know how to design continuous-continuous converters.
- Know the main applications of continuous-continuous converters.

Related activities:
Activity 1: Explanatory session on the operation of the Power Systems Laboratory.
Activity 2: Power Systems laboratory practices.
Activity 3: Individual evaluation test.
Activity 4: Individual evaluation test.

Full-or-part-time: 50h
Theory classes: 15h
Laboratory classes: 5h
Self study : 30h

Title content 2: CONTINUOUS-ALTERNATE CONVERTERS

Description:
2.1 Introduction. Classification.
2.2 Basic structures.
2.3 Applications.

Specific objectives:
- Understand the fundamental principles of DC-AC converters.
- Know and know how to design DC-AC converters.
- Know the main applications of DC-AC converters.

Related activities:
Activity 1: Explanatory session on the operation of the Power Systems Laboratory.
Activity 2: Power Systems laboratory practices.
Activity 3: Individual evaluation test.
Activity 4: Individual evaluation test.

Full-or-part-time: 50h
Theory classes: 15h
Laboratory classes: 5h
Self study : 30h

Title content 3: ALTERNATE-CONTINUOUS CONVERTERS

Description:
3.1 Introduction. Classification.
3.2 Basic structures.
3.3 Applications.

Specific objectives:
- Understand the fundamental principles of AC-DC converters.
- Know and know how to design AC-DC converters.
- Know the main applications of AC-DC converters.

Related activities:
Activity 1: Explanatory session on the operation of the Power Systems Laboratory.
Activity 2: Power Systems laboratory practices.
Activity 4: Individual evaluation test.

Full-or-part-time: 50h
Theory classes: 15h
Laboratory classes: 5h
Self study : 30h

ACTIVITIES

TITLE OF ACTIVITY 1: EXPLANATORY SESSION

Description:
This session serves for the student to become aware of how the practices in this subject will be organized. It will explain the operation of the practices, the organization of the sessions, their evaluation and a brief description of the practices and the materials used in each one will be made. The group-class will be organized in groups of a maximum of 2 students. The Atenea environment will be accessed to observe the disposition of the support materials and to specify the way in which the internship reports and other documents to be evaluated will be delivered.

Specific objectives:
- Knowledge of the objectives set forth in Power Systems practices.

Material:
Athena Virtual Campus.
Practice guide.
Bibliography.
Web links of interest.

Delivery:
Oral communication student / teacher.
Control of attendance at the information session.

Full-or-part-time: 1h
Laboratory classes: 1h

TITLE OF ACTIVITY 2: POWER SYSTEMS LABORATORY PRACTICES

Description:
The organization of these practices consists of the development, by each group of practices, of a project related to the matter explained in theory. This project comprises the following parts:
- Definition of the project
- Information search
- Theoretical design
- Experimental verification
- Construction of the prototype
- Project defense

Specific objectives:
- Use general concepts of Power Systems to carry out a specific design.
- Check the operation and analyze applications of the selected assembly.
- Properly use Power Electronics modeling and simulation tools.
- Interpret data sheets of manufacturers of integrated circuits and power semiconductors.
- Carry out assemblies of power circuits.
- Prepare reports of practices in standardized format.
- Prepare a public presentation of the project and defend it before the teachers of the subject.

Material:
Athena Virtual Campus.
Practice script.
Bibliography.
Links of interest.

Delivery:
Previous and / or complementary studies.
Reports on the evolution of the project.
Attendance at practice sessions.
Oral communication student / teacher.
It represents a part of the continuous evaluation (30%).

Full-or-part-time: 49h
Laboratory classes: 14h
Self study: 35h

TITLE OF ACTIVITY 3: WRITTEN TEST

Description:
Individual test in the classroom related to the learning objectives of the subject contents.

Specific objectives:
Evaluate the general achievement of the objectives of contents 1 and part of the second.

Material:
Statement of the test delivered at the time of the test.

Delivery:
The resolved test is delivered to the teacher.
Represents a part of the continuous assessment of the specific contents of the subject: 35%.

Full-or-part-time: 16h
Theory classes: 2h
Self study: 14h

TITLE OF ACTIVITY 4: WRITTEN TEST

Description:
Individual test in the classroom related to the learning objectives of the subject contents.

Specific objectives:
Evaluate the general achievement of the objectives of contents 1, 2 and 3.

Material:
Statement of the test delivered at the time of the test.

Delivery:
The resolved test is delivered to the teacher.
Represents a part of the continuous assessment of the specific contents of the subject: 35%. If the student demonstrates sufficient knowledge of chapters 1 and part of the second, the teacher may approve activity 3. In this case, activity 4 will count for 70% of the final grade for the subject.

Full-or-part-time: 16h
Theory classes: 2h
Self study: 14h

GRADING SYSTEM

- Activity 2: Power Systems laboratory practices: 30%.
- Activity 3: Written test: 35%.
- Activity 4: Written test: 35%.

Re-evaluation:
The re-evaluation mark can replace the theory mark, which is 70% of the final mark.

EXAMINATION RULES.

If any of the laboratory or continuous evaluation activities is not carried out, it will be considered as not scored.

BIBLIOGRAPHY

Basic:
- Ballester Portillo, Eduard ; Piqué, Robert. Electrónica de potencia [on line]. Barcelona: Marcombo, 2011 [Consultation: 10/06/2022]. Available on: https://search-ebscohost-com.recursos.biblioteca.upc.edu/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=2749464&site=ehost-live&ebv=EK&ppid=Page-__-1. ISBN 9788426716699.

Complementary:
- Rashid, M. H. Electrónica de potencia : circuitos, dispositivos y aplicaciones [on line]. 4a ed. México: Pearson, 2015 [Consultation: 07/06/2022]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6191. ISBN 9786073233255.
- Hart, Daniel W. Electrónica de potencia. Madrid: Prentice-Hall, 2001. ISBN 8420531790.
- Mohan, Ned ; Undeland, Tore M. ; Robbins, Willimas P. Power electronics: converters, applications and design. 3rd ed. New York: John Wiley & Sons, 2003. ISBN 0471429082.

RESOURCES

Other resources:
Electronic component and equipment specification sheets available on the Internet.