DEGREE CURRICULUM

CIRCUIT THEORY

Coordination: PALLEJA CABRE, TOMAS

Academic year 2022-23

CIRCUIT THEORY 2022-23

Subject's general information

<table>
<tr><td>Subject name</td><td>CIRCUIT THEORY</td></tr>
<tr><td>Code</td><td>102128</td></tr>
<tr><td>Semester</td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Automation and Industrial Electronic Engineering</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Common branch in industrial engineering programs - Lleida</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
</table>
</td></tr>
<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><td>PRALAB</td><td>PRAULA</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>0.6</td><td>2.4</td><td>3</td></tr>
<tr><th>Number of groups</th><td>2</td><td>1</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Coordination</td><td>PALLEJA CABRE, TOMAS</td></tr>
<tr><td>Department</td><td>COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>(40%) 60 h classroom or online
(60%) 90 h independent work</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Castellano</td></tr>
</table>

CIRCUIT THEORY 2022-23

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
PALLEJA CABRE, TOMAS	tomas.palleja@udl.cat	6,6	

Subject's extra information

It is a subject that is offered in the second year, is framed in the field of electrical engineering and belongs to specific technology module. The content of this course provides the basis to contextualize the subjects for electronic and automatic control

This subject aims to familiarize students with the transformation of circuits and systems to the Laplace domain. We study the temporal response of circuits using the Laplace transform, is given notion of transfer function and introduces the concepts of natural and forced response. We also study the frequency response of circuits, and emphasize the concepts of resonance, spectrum, stability and filtering. With these basics, it becomes apparent association of transfer function and system, marking the way for the analysis and design of electronic systems and control.
The analysis of circuits and transformed systems is often , in general, new to the student. For this reason the content of this field requires some time to be assimilated. The daily study is the best guarantee that the concepts are consolidated throughout the course.

You can have specific educational material for the subject in Virtual Campus.

PRACTICES AT EPS

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos
Centre the Cultures i Cooperació Transfronterera

http://www.publicacions.udl.cat/

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratoy gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the *Servei de Prevenció de Riscos Laborals de la UdL*: http://www.sprl.udl.cat/alumnes/index.html

Learning objectives

Objectives

- Analyze a circuit using differential equations.
- Know and use the Laplace Transform (LT) to transform circuits and systems.
- Calculate the time response from transformed circuits or systems.
- Understand the concept and get the transfer function of circuits and systems.
- Knowing the meaning of amplitude and phase spectrum of a transfer function.
- Fix the concept of resonance and its spectral and temporary meaning.

Competences

Cross-disciplinary competences approved by the Comissió Plenària dels Graus d'Enginyeria Industrial, Enginyeria Informàtica i Enginyeria de l'Edificació, gathered 16 Juny 2008.

- **EPS1**. Ability to solve problems and develop and defend arguments within their field of study
- **EPS6.** Capacity for analysis and synthesis

Specific competences that students should acquire, according ORDRE CIN/351/2009, 9 of febrer.

- **GEEIA19.** Applied knowledge of electrical engineering.

Subject contents

CHAPTER 1

1.RESISTIVE CIRCUITS. ELEMENTS AND TOOLS

1.1 INTRODUCTION

1.2 ELEMENTS

1.3 KIRCHHOFF'S LAWS. EQUATIONS OF KNOTS AND LOOP

1.4 VOLTAGE-CURRENT CHARACTERISTICS

8.6 PROPOSED PROBLEMS

CHAPTER 9

9. TWO-PORT NETWORKS
9.1. INTRODUCTION
9.2. PARAMETERS ADMITTANCE
9.3. PARAMETERS IMPEDANCE
9.4. PARAMETERS HYBRID
9.5. PARAMETERS OF TRANSMISSION
9.6. CONVERSION OF PARAMETERS
9.7. INTERCONNECTION OF QUADRIPOLES

Methodology

Master class: In the master classes the contents of the subject are presented orally by a professor without the active participation of students.

Problem-based learning: Problem-based learning is used as a method of promoting the learning from selected problems of real life.

Classroom practices: Let you apply and configure a practical level, the theory of a field of knowledge in a particular context.

Development plan

Week	Metodologi	Agenda	Classroom	Autonomous work
1-2	Master class Problem-based learning	RESISTIVE CIRCUITS. ELEMENTS AND TOOLS	6	12
3-5	Master class Problem-based learning	CIRCUITS WITH RESISTORS INDUCTORS AND CAPACITORS SIGNALS AND THEIR CHARACTERISTICS	12	18
6	Master class Problem-based learning	CIRCUITS ANALYSIS IN THE LAPLACE DOMAIN	8	6
7-8	Master class Problem-based learning	RESPONSE IN TIMEOF LINEAR CIRCUITS	10	12
9-11	Master class Problem-based learning	FREQUENCY RESPONSE OF LINEAR CIRCUITS	12	18
12-14	Master class Problem-based learning	PERMANENT SINUSOIDAL REGIME TRANSFORMER TWO-PORT NETWORKS	12	18

Evaluation

Due to the class incremental learning, the second partial exam will have a greater deal than the first one. To avoid students relaxing at the end of the course, a mark higher than 3.5 will be expected at the second partial in order to average it with the practices, that is to say, the final mark will be like so:

First Partial Mark:	***PP***	First Assignment:	***P1***
Second Partial Mark:	***SP***		
Recovery Exam	***RE***	Continuous evaluation	***AC***

Case	Tests marks	Fiinal mark calculation
A	Si (***PP*** ≥ 5 i ***SP*** < 3.5)	***PP*** *0.3 +* ***SP*** *0.4*
B	Si (***PP*** ≥ 5 i ***SP*** ≥ 3.5)	***PP*** 0.3 + ***SP*** 0.4 + ***AC*** 0.1 + ***P1*** 0.2
C	Si (***PP*** < 5 i ***SP*** ≥ 3.5)	***SP*** 0.7 + ***AC*** 0.1 + ***P1*** 0.2
D	Si (***PP*** < 5 i ***SP*** < 3.5)	***SP*** 0.67
E	Si (***RE*** ≥ 3.5)	***AC*** 0.10 + ***P1*** 0.2 + ***RE*** 0.7
F	Si (***RE*** < 3.5)	***RE*** 0.7
For the case B, final marck = max{B,C} *For the case E, final marck = min{E,6.9}*		

Bibliography

Bibliography and resources

Basic Bibliography:

Análisis de circuitos

F. Clariá, J.A. Garriga, J. Palacín

Ed. Edicion de la Universitat de Lleida, 1999

Donald E. Scott.

Introducción al análisis de circuitos, un enfoque sistemático.

Ed. Mc. Graw-Hill. 1988.

William H. Hayat Jr., Jack E. Kemmerly.

Análisis de circuitos en ingeniería.

Ed. Mc. Graw-Hill. 1988.

A. Bruce Carlson.

Circuitos.

Ed. Tomson. 2001

Extended Bibliography:

Josep A. Edminister, Mahmood Nahvi.

Schaum. *Circuitos Eléctricos.*

Ed. Mc. Graw-Hill. 1997

J. D. Irwing.

Análisis básico de circuitos en ingeniería.

Ed. Prentice Hall. 1997

R. Sanjurjo Navarro, E. Lázaro Sanchez, P.de Miguel Rodríguez.

Teoría de *circuitos eléctricos.*

Ed. Mc. Graw-Hill. 1997

James W. Nilsson.

Circuitos Eléctricos.

Ed. Addison Wesley Iberoamericana. 1995

A. Gómez Expósito, J.A. Olivera Ortiz de Urbina.

Problemas resueltos de Teoría de Circuitos.

Ed. Paraninfo. 1990

J.M. Miró, A. Puerta, J.M. Miguel, M. Sanz.

Análisis y diseño de circuitos con PC.

Ed. Marcombo. 1989

Murray R. Spiegel.

Transformadas de Laplace.

Ed. Mc. Graw-Hill. 1985

M. Torres.

Circuitos integrados lineales.

Ed. Paraninfo. 1985

Gladwyn Lago, Lloyd M. Benningfield.

Teoría de sistemas y circuitos.

Ed. Limusa. 1984

J. Herrera.

Teoría de Circuitos.

Ed. Limusa. 1980

F. Jimenez.

Análisis de Circuitos Eléctricos. Teoría y Problemas.

Ed. Limusa. 1980

M.E. Van Walkenburg.

Análisis de Redes.

Ed. Limusa. 1977

Hugh Hildreth Skilling.

Circuitos en ingeniería eléctrica.

Ed. Compañía editorial continental S.A. 1974