

## COURSE: CIRCUIT THEORY

Code: 141212010

Engineering Course: INDUSTRIAL ENGINEER

Year: 2<sup>ND</sup>

Instructor(s):

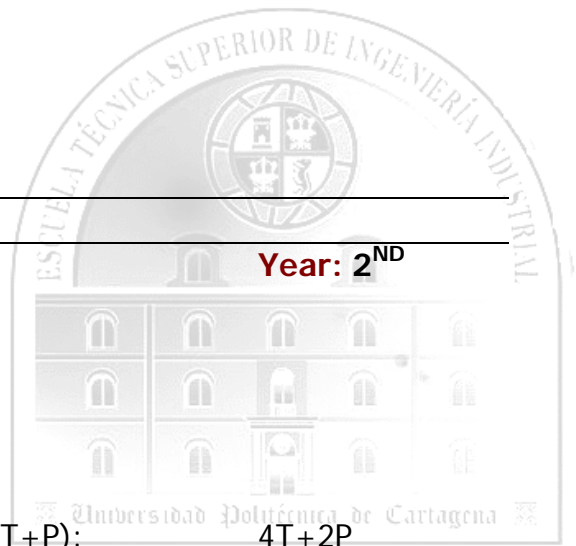
- ANTONIO GABALDON
- LUIS C. PEÑA

Department: ELECTRICAL ENGINEERING

Type (Core / Compulsory / Optional): C

Credits (T+P):

4T+2P



### Contents of the course according to official study plan:

#### **Network analysis and design**

#### **Course objectives:**

The objective of this course is to understand the physical laws that governs the response of circuits. The student should obtain equations to solve circuits in steady and in transitory state through the application of mathematical and software tools. Also, response in sinusoidal steady-state, including Three-Phase Circuits, will be analysed in detail in this course.

#### **Prerequisites and/or corequisites:**

- Calculo (code: 141211003)
- Ampliación de cálculo (code: 141212002)
- Fundamentos Físicos de la Ingeniería (code: 141211007)
- Transformadas Integrales y Ecuaciones en Derivadas Parciales (code: 141212011)

## **SYLLABUS**

### **A. Theory:**

#### Chapter I. Preliminaries

- Lesson 1. Principles and Elements I
- Lesson 2. Principles and Elements II

#### Chapter II. Network Theorems and Techniques

- Lesson 3. Number and formulation of independent equations in networks.
- Lesson 4. Loops analysis revisited.
- Lesson 5. Node analysis revisited.
- Lesson 6. Network Theorems I: Linearity and Superposition
- Lesson 7. Networks Theorems II: Thévenin, Norton, Tellegen

#### Chapter III. Sinusoidal Steady-State Analysis

- Lesson 8. Sinusoidal sources. Use of the phasor transform: applications.
- Lesson 9. Power in the sinusoidal steady-state.
- Lesson 10. Three-phase circuits: principles and definition.

Lesson 11. Balanced three-phase circuits. Power.

#### Chapter IV. Transitory analysis

Lesson 12. First order circuits (I)

Lesson 13. First order circuits (II). Impulse response.

Lesson 14. Second order circuits. Higher order circuits.

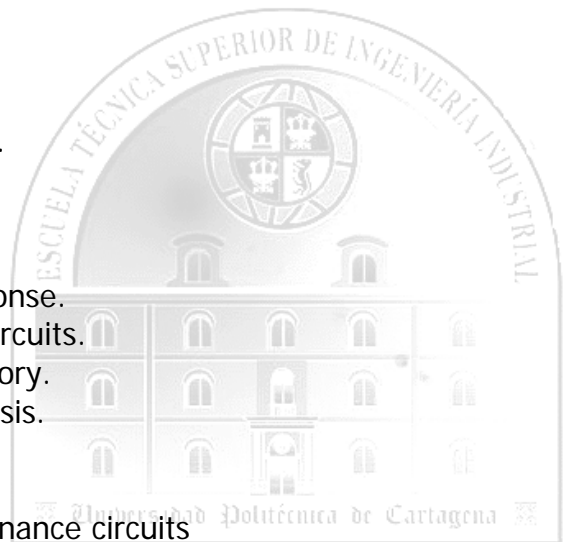
Lesson 15. The Laplace Transform in Circuit Theory.

Lesson 16. Laplace Transform for Network Analysis.

#### Chapter V. Circuit Synthesis and Frequency Response

Lesson 17. Resonance. Design of elemental resonance circuits

Lesson 18. Elementary filters.



### **B. Practices:**

Description of the practice	Duration (h)	Type of practice (problems, laboratory, computing)	Site (Departmental laboratories, computing room, ...)
Networks elements and laboratory apparatus and equipment	3h	Laboratory	Dpt. Of Electrical Engineering (ETSII; Old Navy Hospital)
Network Theorems	2h	Laboratory	Dpt. Of Electrical Engineering (ETSII; Old Navy Hospital)
Steady-state sinusoidal analysis	2h	Laboratory	Dpt. Of Electrical Engineering (ETSII; Old Navy Hospital)
Second Order Response through Circuit Software Tools	2h	Computer classroom	Dpt. Of Electrical Engineering (ETSII; Old Navy Hospital)
Frequency response: resonance.	2h	Laboratory	Dpt. Of Electrical Engineering (ETSII; Old Navy Hospital)
Three-Phase circuit analysis through Software Tools	2h	Computer Classroom	Dpt. Of Electrical Engineering (ETSII; Old Navy Hospital)

### **C. References / Textbooks:**

[1].- CHUA, L.O.; DESOER Ch.A.; KUH E.S. "Linear and non Linear Circuits". Mc Graw-Hill, 1987.

[2].- DESOER, Ch.A.; KUH E.S."Basic Circuit Theory". Mc Graw Hill, ISE 1969

[3].- EDMINISTER, NAHVI. "Circuitos Eléctricos". Ed: Mc Graw Hill, 1997

[4].- KARNI, S. "Applied Circuit Analysis". John Wiley & Sons. 1988

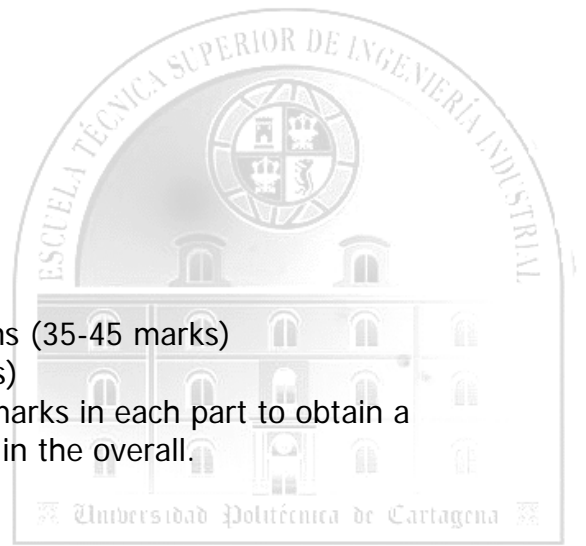
[5].- PARRA, V.M.; PÉREZ, A.; PASTOR, A.; ORTEGA, J. "Teoría de Circuitos" (2 tomos). U.N.E.D., 1981

[6].- THOMAS, R.E.; ROSA, A.J. "Circuitos y señales: introducción a los circuitos lineales y de acoplamiento". Reverté, S.A. 1991.

[7].- GABALDON, A., MOLINA, A., "Problemas de circuitos eléctricos", Ed. Diego Marín, 2000

### **D. Grading:**

- Exam type: written
- Kind of questions:
  - o Theory: a question (10 marks)
  - o Short problems: three or four questions (35-45 marks)
  - o Problems: two questions (50-60 marks)
- Minimum requirements for the areas: 35/100 marks in each part to obtain a positive average qualification and 50/100 marks in the overall.
- Attendance in practice sessions (mandatory).



### **E. Observations:**

- Recommendations for alumni: it is recommendable to use a programmable scientific calculator in the exam and during the classes.
- Legal prerequisites: some courses in the first academic year, i.e., Cálculo, Ampliación de Cálculo, Fundamentos Físicos de la Ingeniería
- Course Web page: it is possible to pose short questions through the e-mail in the following address [antonio.gabaldon@upct.es](mailto:antonio.gabaldon@upct.es)