VNIVERSITAT DE VALÈNCIA

Course Guide
44281 Communications technologies

COURSE DATA

Data Subject	
Code	44281
Name	Communications technologies
Cycle	Master's degree
ECTS Credits	5.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2199 - Master's Degree in Electronic Engineering	School of Engineering	1	Second term

Subject-matter

Degree	Subject-matter	Character
2199 - Master's Degree in Electronic Engineering	2 - Digital systems and communications	Obligatory

Coordination

Name	Department
GONZALEZ MILLAN, VICENTE	242 - Electronic Engineering

SUMMARY

The subject Technology of Communications develops the content necessary to form the electrical engineer in digital transmission at high speed, typically above 200 MHz (100 Mbps) and up to 500 MHz (1 Gbps). The course describes the problems associated with the spread of digital signals in the frequency range that disrupt its integrity, including reflections and couplings and techniques to minimize these effects (terminations, adaptations, topologies). Concepts of the power distribution and timing and thermal aspects are also introduced.

The course provides a balance between the development of the theoretical aspects and simulations to observe and analyze the phenomena described. For this purpose, the Allegro SigXpert and Cadence tools are used.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

The background needed to follow the subject are: logic families and their typical output structures (totem-pole, open collector), circuits with transistors and signal propagation in transmission lines. On this last requirement its recommended to have followed the subject "Propagation on Physical Media" in the same Master of Electronic Engineering.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2199 - Master's Degree in Electronic Engineering

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Take into account the economic and social context in engineering solutions, be aware of diversity and multiculturalism and ensure sustainability and respect for human rights and equality between men and women.
- Diseñar un sistema, componente o proceso que cumpla unas especificaciones desde diferentes puntos de vista: electrónico, económico, social, ético y medioambiental.
- Demostrar una comprensión sistemática de un campo de estudio y el dominio de las habilidades.
- Realizar un análisis crítico, evaluación y síntesis de ideas nuevas y complejas.
- Ser capaz de fomentar, en contextos académicos y profesionales, el avance tecnológico, social o cultural dentro de una sociedad basada en el conocimiento.
- Capacidad para proyectar, calcular y diseñar productos, procesos e instalaciones en todos los ámbitos de la Ingeniería Electrónica y en particular los de tratamiento de la señal, sistemas digitales y de comunicaciones y electrónica industrial.
- Capacidad para el modelado matemático, cálculo y simulación en todos los ámbitos relacionados con la Ingeniería Electrónica y campos multidisciplinares afines. En especial los de tratamiento de la señal, sistemas digitales y de comunicaciones y electrónica industrial.

- Conocer las técnicas avanzadas para la propagación de señales y datos mediante soporte físico, haciendo especial hincapié en el estudio de casos prácticos y el diseño de circuitos de microondas mediante líneas de transmisión.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Upon completion of the course, students should be able to:

- Understanding the key mechanisms affecting the high-speed digital communication

- Know the main topological structures used in the circuit boards and their characteristics from the point of view of signal propagation

- Know the topological and electrical parameters that modify the effects on signal integrity

- Be able to design proper terminations for signal propagation in either single-ended to differential.

- Be able to design a basic structure of food distribution taking into account the characteristics of the signals used in the system

- Carry out a statistical study of the power dissipation of a system and determine the most appropriate location of the components to prevent heat problems

- To estimate the reliability of a system.

DESCRIPTION OF CONTENTS

1. Introduction to signal integrity

Signal integrity.
Evolution of technology.
Analysis of the interconnections.
Spectral content.
Signaling standards.
High-speed logic families
Modelling.

2. Fundamentals of high-speed digital communications through guided media

Localized and distributed parameters.
Transmission lines.
Multiconductor transmission lines.

3. Noise and crosstalk

Introduction.
Crosstalk.
Crosstalk in transmission lines.
Backplane connections.
Simultaneous Switching Noise.

4. PLL and syntethizers

Introduction
Terminations
Connectors
Vias

5. Power and Clock distribution networks (PDN and CDN)

Introduction.
Jitter.
Clock signal distribution.
Power distribution.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	25,00	100
Laboratory practices	25,00	100
Development of group work	25,00	0
Study and independent work	10,00	0
Readings supplementary material	5,00	0
Preparing lectures	25,00	0
Preparation of practical classes and problem	10,00	0
TOTAL	**125,00**	

TEACHING METHODOLOGY

The teaching methods employed in the development of the course are:

a) Theoretical activities.

Expository development of matter with the student's participation in the resolution of specific issues.

b) Practical activities.

Solving practical problems

c) Student's personal work.

Description: Performing outside the classroom to issues and problems as well as the preparation of classes and exams (study). This task will be performed individually and try to promote self-employment.

We will use e-learning platforms (LMS) to support communication with students. Through it the student will have access to course materials used in class, as well as solving problems and exercises.

EVALUATION

The evaluation of the course will be conducted by performing a test that will take the form of an individual examination or group work about the contents of the subject.

REFERENCES

Basic

- Apuntes de la asignatura.
- High-speed digital design : a handbook of black magic. Howard W. Johnson, Martin Graham, Prentice Hall International, 1993Computer Circuits Electrical Design. R. K.Poon
- High-speed digital system design : a handbook of interconnect theory and design practices. Stephen H. Hall, Garrett W. Hall, James A. McCall, John Wiley & Sons, 2001
- Handbook of digital techniques for high-speed design : design examples, signaling and memory technologies, fiber optics, modeling and simulation to ensure signal integrity / Tom Granberg, Prentice Hall, 2004
- Digital signal integrity : modeling and simulation with interconnects and packages. Brian Young, Prentice Hall, 2001,

Additional

- Signal Integritysimplified. E. Bogatin. Prentice Hall, 2004 (e-book).
- Signal an dpower integrity, simplified. E. Bogatin. Prentice Hall, 2010 (e-book)
- High-speed circuit board signal integrity. S. C. Thierauf. Artech House, 2004 (e-book)

- High-speed signal propagation: advanced black magic. H. Johnson. Prentice Hall, 2003 (e-book)
- A signal integrity engineers companion: real-time test and measurement and design simulation. G. Lawday. Prentice Hall, 2008 (e-book)
- Frequency-domain characterization of power distribution networks. I. Novak. Artech House, 2007.