

230108 - CRS - Remote Control Systems

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering		
Teaching unit:	739 - TSC - Department of Signal Theory and Communications 710 - EEL - Department of Electronic Engineering		
Academic year:	2019		
Degree:	BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)		
ECTS credits:	6	Teaching languages:	Catalan, Spanish, English

Teaching staff

Coordinator:	Santiago Silvestre Juan Antonio Chávez
Others:	Juan Antonio Chávez Santiago Silvestre

Prior skills

Basic electronic devices: diodes, transistors and passive elements. Basic, digital and analogue electronic circuits.

Learning objectives of the subject

The main objective is to study the options available to develop a wireless control system, focusing especially on infrared (IR) and radio frequency (RF) based designs. To analyse a variety of case studies, considering the available commercial options and specific applications. Basic concepts of the course are : RF (UHF) senders and receivers, IR senders and receivers, encoder and decoder families, modulation and demodulation, the IrDA standard, an introduction to the WLAN, IEEE and Bluetooth standards.

Study load

Total learning time: 150h	Hours large group:	26h	17.33%
	Hours small group:	26h	17.33%
	Self study:	98h	65.33%

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Content

1. Introduction

Degree competences to which the content contributes:

1.1. Introducción, Aplicaciones del control remoto de sistemas

Degree competences to which the content contributes:

1.2. Sistemas de control basados en radiofrecuencia (RF), Asignación de frecuencias

Degree competences to which the content contributes:

1.3. Diagrama de bloques de un sistema de control RF

Degree competences to which the content contributes:

1.4. Codificación y Descodificación.

Degree competences to which the content contributes:

1.5. Familias Motorola MC1450XX y Holtek HT12X

Degree competences to which the content contributes:

2. Wireless RF based control systems

Degree competences to which the content contributes:

2.1. Introducción

Degree competences to which the content contributes:

2.2. Tipos de modulación

Degree competences to which the content contributes:

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2.3. Modulaciones analógicas

Degree competences to which the content contributes:

2.4. Modulación y desmodulación AM, diagramas de bloques de emisor y receptor AM

Degree competences to which the content contributes:

2.5. Modulaciones exponenciales

Degree competences to which the content contributes:

2.6. Modulación y demodulación en frecuencia

Degree competences to which the content contributes:

2.7. Diagramas de bloques de emisor y receptor FM

Degree competences to which the content contributes:

2.8. Ejemplos de VCO, PLL, modulador FM MC23833

Degree competences to which the content contributes:

2.9. Modulaciones digitales: FSK, ASK, QPSK

Degree competences to which the content contributes:

2.10. Modulación FSK. Ejemplo: Diagrama de bloques de un Modem

Degree competences to which the content contributes:

2.11. Ejemplos Comerciales de Emisores y Receptores

Degree competences to which the content contributes:

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3. Consideraciones sobre diseño de antenas y PCB's

Degree competences to which the content contributes:

3.1. Introducción. Tipos de antenas en aplicaciones de CRS

Degree competences to which the content contributes:

3.2. Características principales de la antena. Comparativa de tipos de antena

Degree competences to which the content contributes:

3.3. Consideraciones sobre diseño de PCBs en RF

Degree competences to which the content contributes:

3.4. Problemas relacionados con la Alimentación y técnicas de reducción ruido

Degree competences to which the content contributes:

3.5. Técnicas de reducción de consumo en recepción

Degree competences to which the content contributes:

4. Introducción a las redes de área local sin hilos, WLAN

Degree competences to which the content contributes:

4.1. Introducción

Degree competences to which the content contributes:

4.2. Estándares en WLAN : IEEE, Bluetooth, Home RFs

Degree competences to which the content contributes:

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4.3. Técnicas de espectro ensanchado FHSS y DSSS

Degree competences to which the content contributes:

4.4. Comparativa de protocolos, opciones comerciales

Degree competences to which the content contributes:

4.5. Tendencias del mercado

Degree competences to which the content contributes:

4.6. Ejemplos : STD-402, LMX316

Degree competences to which the content contributes:

5. Sistemas de control basados en la radiación Infrarroja

Degree competences to which the content contributes:

5.1. Símbolos y nomenclatura

Degree competences to which the content contributes:

5.2. El cuerpo negro

Degree competences to which the content contributes:

5.3. Emisividad

Degree competences to which the content contributes:

5.4. Ángulo sólido

Degree competences to which the content contributes:

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5.5. Transferencia de energía

Degree competences to which the content contributes:

6. Fuentes naturales de radiación IR

Degree competences to which the content contributes:

6.1. Introducción

Degree competences to which the content contributes:

6.2. El Sol

Degree competences to which the content contributes:

6.3. El cielo

Degree competences to which the content contributes:

7. Emisores de IR

Degree competences to which the content contributes:

7.1. Principios de funcionamiento de los emisores de IR

Degree competences to which the content contributes:

7.2. Característica I-V de los emisores de IR

Degree competences to which the content contributes:

7.3. Cálculo de la potencia radiada

Degree competences to which the content contributes:

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7.4. Interpretación de las especificaciones del fabricante

Degree competences to which the content contributes:

7.5. Circuitos de aplicación

Degree competences to which the content contributes:

7.6. Seguridad ocular

Degree competences to which the content contributes:

8. Detectores de IR

Degree competences to which the content contributes:

8.1. Detectores fotovoltaicos

Degree competences to which the content contributes:

8.2. Interpretación de las especificaciones del fabricante

Degree competences to which the content contributes:

8.3. Circuitos de polarización

Degree competences to which the content contributes:

8.4. Circuitos amplificadores con AO

Degree competences to which the content contributes:

8.5. Circuitos de recepción con BJT

Degree competences to which the content contributes:

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8.6. Respuesta frecuencial de los detectores

Degree competences to which the content contributes:

9. Sistemas Integrados de control remoto para IR

Degree competences to which the content contributes:

9.1. Formato RC5, NEC y Sharp ASK

Degree competences to which the content contributes:

9.2. Ejemplos de emisores y receptores IR comerciales

Degree competences to which the content contributes:

9.3. Controladores para TV, vídeo, computadoras y microcontroladores

Degree competences to which the content contributes:

10. Estándar de comunicación y control IrDA

Degree competences to which the content contributes:

10.1. Introducción

Degree competences to which the content contributes:

10.2. Protocolos IrDA Data y IrDA Control

Degree competences to which the content contributes:

10.3. Nivel físico

Degree competences to which the content contributes:

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10.4. Dispositivos específicos

Degree competences to which the content contributes:

10.5. Aplicaciones

Degree competences to which the content contributes:

Qualification system

- Final exam 45%
- Laboratory practicals 40%
- Oriented Activities 15%

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Bibliography

Basic:

Apunts dels diferents mòduls al Campus Digital.

Enunciats de pràctiques de l'assignatura.

Dereniak, E.L.; Boreman, G.D. Infrared detectors and systems. New York [etc.]: John Wiley and Sons, 1996. ISBN 0471122092.

Feher, K. Wireless digital communications: modulation and spread spectrum applications. Upper Saddle River: Prentice Hall, 1995. ISBN 0130986178.

Wilson, J.; Hawkes, J.F.B. Optoelectronics: an introduction. 3rd ed. London [etc.]: Prentice Hall, 1998. ISBN 013103961X.

Larson, L.E. (ed.). RF and microwave circuit design for wireless communications. Boston, MA; London: Artech house, 1997. ISBN 0890068186.

Vincent, J.D. Fundamentals of infrared detector operation and testing [on line]. 2nd ed. New York: Wiley, 1990 [Consultation: 14/09/2018]. Available on: <<https://onlinelibrary.wiley.com/doi/book/10.1002/9781119011897>>. ISBN 9781119011897.

Sayre, C.W. Complete wireless design. 2nd ed. New York [etc.]: McGraw Hill, 2008. ISBN 9780071544528.

Complementary:

Franco, S. Design with operational amplifiers and analog integrated circuits. 3rd, int. ed. Boston [etc.]: McGraw Hill, 2002. ISBN 0071121730.

Dhawan, C. Remote access networks: PSTN, ISDN, ADSL, Internet and wireless. New York [etc.]: McGraw Hill, 1998. ISBN 0070167745.

Santamaria, A.; López-Hernández, F.J. (eds.). Wireless LAN systems. Boston ; London: Artech House, 1994. ISBN 0890066094.

Muller, N.J. Wireless data networking. Boston; London: Artech House, 1995. ISBN 0890067538.

Others resources: