



Guía docente

230666 - ESIOT - Sistemas Electrónicos para Internet de las Cosas

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Unidad responsable: Escuela Técnica Superior de Ingeniería de Telecomunicación de Barcelona

Unidad que imparte: 710 - EEL - Departamento de Ingeniería Electrónica.

Titulación: MÁSTER UNIVERSITARIO EN INGENIERÍA ELECTRÓNICA (Plan 2013). (Asignatura optativa).
INGENIERÍA ELECTRÓNICA (Plan 1992). (Asignatura optativa).
MÁSTER UNIVERSITARIO TECNOLOGÍAS DE LA INFORMACIÓN Y LA COMUNICACIÓN (Plan 2009). (Asignatura optativa).
MÁSTER UNIVERSITARIO EN INGENIERÍA ELECTRÓNICA (Plan 2009). (Asignatura optativa).

Curso: 2016

Créditos ECTS: 5.0

Idiomas: Catalán, Inglés

PROFESORADO

Profesorado responsable: J. CABESTANY

Otros: J.M. MORENO, J. MADRENAS, F. MOLL, A. RUBIO

COMPETENCIAS DE LA TITULACIÓN A LAS QUE CONTRIBUYE LA ASIGNATURA

Transversales:

1. SOSTENIBILIDAD Y COMPROMISO SOCIAL: Conocer y comprender la complejidad de los fenómenos económicos y sociales típicos de la sociedad del bienestar; tener capacidad para relacionar el bienestar con la globalización y la sostenibilidad; lograr habilidades para utilizar de forma equilibrada y compatible la técnica, la tecnología, la economía y la sostenibilidad.
2. TRABAJO EN EQUIPO: Ser capaz de trabajar como miembro de un equipo interdisciplinar, ya sea como un miembro más o realizando tareas de dirección, con la finalidad de contribuir a desarrollar proyectos con pragmatismo y sentido de la responsabilidad, asumiendo compromisos teniendo en cuenta los recursos disponibles.
3. USO SOLVENTE DE LOS RECURSOS DE INFORMACIÓN: Gestionar la adquisición, la estructuración, el análisis y la visualización de datos e información en el ámbito de especialidad, y valorar de forma crítica los resultados de dicha gestión.
4. TERCERA LENGUA: Conocer una tercera lengua, preferentemente el inglés, con un nivel adecuado oral y escrito y en consonancia con las necesidades que tendrán los titulados y tituladas.

METODOLOGÍAS DOCENTES

- Sesiones de teoría- Sesiones de laboratorio- Sesiones de trabajo práctico en el laboratorio- Trabajo en grupo (no presencial) - Presentaciones orales- Examen final

OBJETIVOS DE APRENDIZAJE DE LA ASIGNATURA

Learning objectives of the subject: Body area networks (BANs) are networks of wireless sensors and medical devices embedded in clothing, worn on or implanted in the body and have the potential to revolutionize healthcare by enabling pervasive healthcare. "Electronic design of BANs" will allow the design of intelligent, autonomous electronic personal companions that will assist us from infancy to old age. The devices and systems must be private and secure featuring sensing, computation and communication beyond human capabilities. It will explore and develop "zero-power" technologies that push the scientific and technological limits of energy per processed bit of information, with a possible harvest of their own energy. Low power and ultra-low energy technology will be presented. Zero power technologies will become a key innovation platform for European industry, large component manufacturers, system integrators, service providers and SMEs. Additionally, these devices and systems must consider usability concepts and they must include the user in the design cycle from the very beginning. Learning results of the subject: - Ability to understand and differentiate the main building blocks and functionality of a Body Area Network (BAN) system. - Ability to analyze and use zero power concepts for the specification and design of the system. - Ability to understand, select and implement correct communication protocols for BAN systems. - Ability to understand, manage and use usability concepts for design ("usability for design"). - Ability to develop techniques for the design, analysis and evaluation of electronic systems in applications such as automation, aerospace, energy distribution and generation, consumer electronics, biomedicine, etc. - Ability to synthesize and solve problems related to the electronic engineering discipline, to apply learning techniques in complex and multiple contexts, to apply previous knowledge to new situations and contexts, as well as the ability to coordinate and work in a team. - Ability to design electronic systems with specific constraints (low-power, real-time processing capability, sensor integration). - Ability to design wearable electronic systems for telecare and eHealth purposes (usability concepts must be considered)

HORAS TOTALES DE DEDICACIÓN DEL ESTUDIANTADO

Tipo	Horas	Porcentaje
Horas aprendizaje autónomo	86	68.80
Horas grupo pequeño	13	10.40
Horas grupo grande	26	20.80

Dedicación total: 125 h

CONTENIDOS

(CAST) 1. Introduction

Descripción:

Learning objectives of the subject: Body area networks (BANs) are networks of wireless sensors and medical devices embedded in clothing, worn on or implanted in the body and have the potential to revolutionize healthcare by enabling pervasive healthcare. "Electronic design of BANs" will allow the design of intelligent, autonomous electronic personal companions that will assist us from infancy to old age. The devices and systems must be private and secure featuring sensing, computation and communication beyond human capabilities. It will explore and develop "zero-power" technologies that push the scientific and technological limits of energy per processed bit of information, with a possible harvest of their own energy. Low power and ultra-low energy technology will be presented. Zero power technologies will become a key innovation platform for European industry, large component manufacturers, system integrators, service providers and SMEs. Additionally, these devices and systems must consider usability concepts and they must include the user in the design cycle from the very beginning. Learning results of the subject: - Ability to understand and differentiate the main building blocks and functionality of a Body Area Network (BAN) system. - Ability to analyze and use zero power concepts for the specification and design of the system. - Ability to understand, select and implement correct communication protocols for BAN systems. - Ability to understand, manage and use usability concepts for design ("usability for design"). - Ability to develop techniques for the design, analysis and evaluation of electronic systems in applications such as automation, aerospace, energy distribution and generation, consumer electronics, biomedicine, etc. - Ability to synthesize and solve problems related to the electronic engineering discipline, to apply learning techniques in complex and multiple contexts, to apply previous knowledge to new situations and contexts, as well as the ability to coordinate and work in a team. - Ability to design electronic systems with specific constraints (low-power, real-time processing capability, sensor integration). - Ability to design wearable electronic systems for telecare and eHealth purposes (usability concepts must be considered)



(CAST) 2. Power supply system consideration and design

Descripción:

- Concepts of power and energy budget of the system- Battery technology and operation- Energy harvesting systems for BAN

(CAST) 3. Low power data processing

Descripción:

- Clock management system- Low power operating modes- Wake-up and sleep procedures- Power management at the system level- Existing examples

(CAST) 4. Sensors and interfaces

Descripción:

- Body and health related sensors. The case of inertial sensors- Safety of BAN sensors- Low power digital sensors- Communication protocols: 1-wire, I2C, SPI,...

(CAST) 5. Communication protocols in BAN

Descripción:

- Bluetooth 4.0- ANT+- IEEE 802.15.5 standard- Health profiles and security issues.

ACTIVIDADES

(CAST) LABORATORY

Dedicación: 25 h

Grupo pequeño/Laboratorio: 25h

(CAST) ORAL PRESENTATION

Descripción:

Presentation of a work group.

Dedicación: 20 h

Grupo pequeño/Laboratorio: 20h

(CAST) EXTENDED ANSWER TEST (FINAL EXAMINATION)

SISTEMA DE CALIFICACIÓN

Examen final: de 20% a 30% Trabajo en grupo: de 40% a 50% Laboratorio: de 20% a 40%



BIBLIOGRAFÍA

Básica:

- Yang, G.-Z. Body sensor networks. New York: Springer, 2006. ISBN 978-1-84628-272-0.

Complementaria:

- Gupta, S. K.S.; Mukherjee, T.; Venkatasubramanian, K.K. Body area networks: safety, security, and sustainability [en línea]. Cambridge University Press, 2013 [Consulta: 28/09/2015]. Disponible a: <http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10679171>. ISBN 9781107347915.