



Guia docent

230666 - ESIOT - Sistemes Electrònics per Internet de les Coses

Última modificació: 08/03/2016

Unitat responsable: Escola Tècnica Superior d'Enginyeria de Telecomunicació de Barcelona

Unitat que imparteix: 710 - EEL - Departament d'Enginyeria Electrònica.

Titulació: MÀSTER UNIVERSITARI EN ENGINYERIA ELECTRÒNICA (Pla 2013). (Assignatura optativa).
ENGINYERIA ELECTRÒNICA (Pla 1992). (Assignatura optativa).
MÀSTER UNIVERSITARI EN TECNOLOGIES DE LA INFORMACIÓ I LA COMUNICACIÓ (Pla 2009).
(Assignatura optativa).
MÀSTER UNIVERSITARI EN ENGINYERIA ELECTRÒNICA (Pla 2009). (Assignatura optativa).

Curs: 2016

Crèdits ECTS: 5.0

Idiomes: Anglès, Català

PROFESSORAT

Professorat responsable: J. CABESTANY

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

COMPETÈNCIES DE LA TITULACIÓ A LES QUALS CONTRIBUEIX L'ASSIGNATURA

Transversals:

1. SOSTENIBILITAT I COMPROMÍS SOCIAL: Conèixer i comprendre la complexitat dels fenòmens econòmics i socials típics de la societat del benestar; tenir capacitat per relacionar el benestar amb la globalització i la sostenibilitat; assolir habilitats per usar de forma equilibrada i compatible la tècnica, la tecnologia, l'economia i la sostenibilitat.
2. TREBALL EN EQUIP: Ser capaç de treballar com a membre d'un equip interdisciplinari, ja sigui com un membre més o duent a terme tasques de direcció, amb la finalitat de contribuir a desenvolupar projectes amb pragmatisme i sentit de la responsabilitat, tot assumint compromisos considerant els recursos disponibles.
3. ÚS SOLVENT DELS RECURSOS D'INFORMACIÓ: Gestionar l'adquisició, l'estructuració, l'anàlisi i la visualització de dades i informació de l'àmbit d'especialitat, i valorar de forma crítica els resultats d'aquesta gestió.
4. TERCERA LLENGUA: Conèixer una tercera llengua, preferentment l'anglès, amb un nivell adequat oral i escrit i en consonància amb les necessitats que tindran els titulats i titulades.

METODOLOGIES DOCENTS

- Sessions de teoria
- Sessions de laboratori
- Sessions de treball pràctic al laboratori
- Treball en grup (no presencial)
- Presentacions Orals
- Examen final

OBJECTIUS D'APRENTATGE DE L'ASSIGNATURA

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)

HORES TOTALS DE DEDICACIÓ DE L'ESTUDIANTAT

Tipus	Hores	Percentatge
Hores grup petit	13,0	10.40
Hores grup gran	26,0	20.80
Hores aprenentatge autònom	86,0	68.80

Dedicació total: 125 h

CONTINGUTS

(CAT) 1. Introduction

Descripció:

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)

Dedicació: 20h

Grup gran/Teoria: 4h

Grup petit/Laboratori: 2h

Aprenentatge autònom: 14h

(CAT) 2. Power supply system consideration and design

Descripció:

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

Dedicació: 26h

Grup gran/Teoria: 6h

Grup petit/Laboratori: 6h

Aprenentatge autònom: 14h



(CAT) 3. Low power data processing

Descripció:

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

Dedicació: 26h

Grup gran/Teoria: 6h

Grup petit/Laboratori: 6h

Aprenentatge autònom: 14h

(CAT) 4. Sensors and interfaces

Descripció:

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

Dedicació: 26h

Grup gran/Teoria: 6h

Grup petit/Laboratori: 6h

Aprenentatge autònom: 14h

(CAT) 5. Communication protocols in BAN

Descripció:

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

Dedicació: 26h

Grup gran/Teoria: 6h

Grup petit/Laboratori: 6h

Aprenentatge autònom: 14h

ACTIVITATS

(CAT) LABORATORY

Dedicació: 25h

Grup petit/Laboratori: 25h



(CAT) ORAL PRESENTATION

Descripció:

Presentation of a work group.

Dedicació: 20h

Grup petit/Laboratori: 20h

(CAT) EXTENDED ANSWER TEST (FINAL EXAMINATION)

SISTEMA DE QUALIFICACIÓ

Examen final: de 20% s 30%

Treball en grup: de 40% a 50%

Laboratori: de 20% a 40%

BIBLIOGRAFIA

Bàsica:

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

Complementària:

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