Guia docent

205121 - 205121 - Sistemes de Radiocomunicacions Industrials

Última modificació: 22/04/2022

Unitat responsable: Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa

Unitat que imparteix: 739 - TSC - Departament de Teoria del Senyal i Comunicacions.


MÀSTER UNIVERSITARI EN ENGINYERIA AERONÀUTICA (Pla 2014). (Assignatura optativa).

MÀSTER UNIVERSITARI EN ENGINYERIA ESPACIAL I AERONÀUTICA (Pla 2016). (Assignatura optativa).

Curs: 2022

Crèdits ECTS: 3.0

Idiomes: Anglès

PROFESSORAT

Professorat responsable: Bertran Albertí, Eduard

Altres:

METODOLOGIES DOCENTS

It will be assumed that the students have previously enrolled in the course of Fundamentals of Industrial Wireless Communications.

The theoretical sessions (large groups) belonging to the first syllabus module are based on traditional lectures, where the formal explanation of the professor is combined with previous student’s motivations, aiming to motivate the problem to be solved and to prepare the acquisition of the basic concepts. It will be ensured that the expository cadence is assumable by students, adapting the teaching of the different points of the module among different taxonomies, comprised between teaching (operation capability) and showing (knowledge and language), according to the time and the relevance of each particular topic regarding the objectives of the course. The second module has a more disseminator profile, where the knowledge acquired throughout the course is applied, consolidated and, occasionally, expanded.

In the application / laboratory sessions, students can work individually or in couples, either doing work from simulation programs, professional documentation (standards and catalogs) or radio-communication (hardware) products.

OBJECTIUS D'APRENETATGE DE L'ASSIGNATURA

This subject is a continuation, in a more practical approach, of the previous subject of FUNDAMENTALS OF INDUSTRIAL WIRELESS COMMUNICATION. This new subject goes on with the study and evaluation of equipment, subsystems and structures constitutive of a radio-communication system, and case-studies from regulations, standards and real products are developed. This will include evaluating whether a radio-communication equipment/system complies with regulations in order to face its homologation, or for its allowable use in the public radio-electric spectrum. Simulation of communications equipment and subsystems is carried out, and an SDR receiver is started up and experimented with.

HORES TOTALS DE DEDICACIÓ DE L'ESTUDIANTAT

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Dedicació total: 75 h
**CONTINGUTS**

**Module 1: Radiommunication equipment and subsystems**

Descripció:
- Radio links and propagation mechanisms. Power levels. Frequency bands according to applications and licenses. QoS.
- Fundamental parameters to buy or specify RF equipment: - Related to power amplifiers (bandwidths, powers, intermodulations, consumption / energy efficiency). Standing waves and protections. - Related to receiver front-end (noise, sensitivity, filtered stability, auto-couplings).

Activitats vinculades:
- Theoretical lectures with examples.
- Practice 1. Simulations: 4nec2, RFSIM, smithchart.net ...
- Practice 2: Radio link computation - link budget (Radio Mobile program).

Dedicació: 46h
Grup gran/Teoria: 16h
Aprenentatge autònom: 30h

**Module 2: Radio standards for industry applications**

Descripció:
Practical lectures: introduction and discussion of some radio-communications standards: PMR, TETRA, industrial radio buses, NFC / RFID, Bluetooth, Zigbee, WiFi and other standards of the IEEE, GSM, UMTS, LTE, 5G, ...

Activitats vinculades:
Practice 3: Evaluation / comparison of the physical layer of chipsets (type Bluetooth, Zigbee, 802.11ac, LoRa, ...)  

Dedicació: 12h
Grup gran/Teoria: 4h
Aprenentatge autònom: 8h

**Module 3: Applications (guided projects)**

Descripció:
(individually or in couples). A work to be chosen among:  
- Start-up and experimentation of an SDR receiver, type RTL2832U.  
- Programming a WiFi connection by means of Arduino UNO WIFI  
- Searching a commercialized emitter and / or a receiver suitable(s) for a certain application (to be chosen). Evaluate the technical characteristics and foresee the difficulties that could arise from the points of view of QoS and product acceptance.  
- Finding a set of integrated circuits allowing the necessary functions to be carried out for a certain standard (LoRa, Bluetooth, ...), in the way they can be integrated on the same printed circuit board where there is, for example, the electronic controller of an industrial product.  
- Select and advance into someone of the other topics covered along the course.

Activitats vinculades:  
Application's development

Dedicació: 17h
Grup gran/Teoria: 7h
Aprenentatge autònom: 10h
SISTEMA DE QUALIFICACIÓ

What is sought in the course is to acquire knowledge at the level of understanding, analysis and evaluation, more at the qualitative level than at the quantitative one. So, the evaluation will be based on the reports of the works and practices. The final work will have a weight of 40%, being the rest of work individually weighted at 20%.