30354 - Mobile Networks

Información del Plan Docente

Academic Year   2017/18

Faculty / School   110 - Escuela de Ingeniería y Arquitectura

Degree   438 - Bachelor's Degree in Telecomunications Technology and Services Engineering

ECTS   6.0

Year

Semester   Second semester

Subject Type

Module   ---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The learning process that is designed for this subject is based on the following: The teaching-learning methodologies to be undertaken to achieve the proposed learning results are as follows: **Participatory lecture** (45 hours). Presentation by the teacher of the main contents of the subject, combined with the active participation of students. This activity will take place in the classroom in person. This methodology, supported with the individual student's study is designed to provide students with the theoretical foundations of the subject content. **Problem-based learning sessions** in the classroom (12 hours). Problem solving and practical cases proposed by the teacher, with the possibility of exposing them by students

individually or in groups authorized by the teacher. This activity will take place in the classroom in person, and may require preparatory work by students. **Two tutored practical works** (30 hours). This activity will advance all proposed learning outcomes. Follow-up sessions will be conducted by the teacher in which each student will present their work. **External visit** (3 hours). A visit to the company TELTRONIC.S.A.U., manufacturer of mobile communications equipment for the professional market will be held.

Personalized attention to students through tutorials. Assessment tests. Personal work of the student .

5.2.Learning tasks

1 Theoretical/practical sessions in the classroom practices, whose main contents are organized as described in detail in the next section.

2 tutored practical work aimed at solving practical cases analysis, design, dimensioning and planning of mobile networks by applying techniques and procedures seen in theoretical and problem sessions. The evolution of the work will be presented periodically to the teacher and an explanatory final report of solving methodology followed by the student and justification of the proposed solution will be delivered. 3 External visit to the Company TELTRONIC.S.A.U, located in the Malpica Industrial Estate in Zaragoza, and dedicated to the design and manufacture of terminals, network equipment and applications for professional mobile communications (public security, fire, etc.).

5.3.Syllabus

Block 0. Introduction .

- *Course presentation* .
- *General concepts:* Introduction to mobile networks. Mobility implications

Block 1. Fundamentals of Mobile Communications Netwoks.

- *Cellular networks. General functions. Mobile network architecture: Access networks and core network.*
- *Spectrum, standardization and regulation.*
- *Effects of radio channel and transmission systems: Propagation losses, shadowing, fast fading, Doppler shift. Environments classification. Co-channel interference, adjacent cannel interference, non-linear distortion.*
- *Radio engineering techniques: Physical layer: Modulation, cannel coding, interleaving, diversity, cannel equalization. DuplexingTécnicas de ingeniería radio: Nivel físico: Modulación, codificación de canal, entrelazado, diversidad, ecualización de canal. Duplexing (FDD and TDD). Multiple Access (FDMA, TDMA, CDMA, OFDMA).*
- *Technologies, services and aplications.*

Block 2. Mobile Network Functions.

- *Mobility Management: Location procedures, paging, handover. Radio Resource Management. Quality of Service Management.*
- *Network Architectures: Mobile network functional elements. Network topology. 2G, 3G and 4G networks. Other wireless access networks. Cellular networks (GSM, UMTS, LTE, TETRA)*

Block 3. Second Generation Mobile Networks.

- *GSM and GPRS networks:*
- *Air interface structure. Physical and logical channels definition and organization.*
- *Network functions implementation on the air interface.*

Block 4. Third Generation Mobile Networks.

- *Fundamentals of CDMA based mobile networks.*
- *Dimensioning of third generation CDMA based mobile networks. Access and core networks.*
- *Third generation mobile networks: UMTS, HSDPA/HSUPA:*
- *Evolution towards forth generation mobile networks: LTE*
- o *Air interface structure. Physical and logical channels definition and organization.*
- o *Network functions implementation on the air interface.*

5.4.Course planning and calendar

The schedule of the course will be defined by the EINA in the academic calendar of the corresponding course. The date of the external visit will be agreed during the course.

5.5.Bibliography and recommended resources

Basic bibliography

- Eberspächer, J.. GSM - Architecture, Protocols and Services / J. Eberspächer, H.J. Vögel, C. Bettstetter, C. Hartmann Ed. Wiley, 2008
- Heine, G. GPRS: Gateway to Third Generation Mobile Networks / G. Heine, H. Sagkob Artech House, 2003
- Pérez Romero, J. Radio Resource Management Strategies in UMTS / J. Pérez Romero, O. Sallent, R. Agustí, M. A. Díaz-Guerra Wiley, 2005.

Further reading.

- WCDMA for UMTS - HSPA evolution and LTE / edited by Harri Holma and Antti Toskala . - 4th ed., repr. Chichester (England) : John Wiley & Sons, 2008
- Dahlman, E. 3G Evolution: HSPA and LTE for Mobile Broadband / E. Dahlman, S. Parkvall, J. Sköld, P. Beming. Academic Press- Elsevier, 2008.