

230313 - COGRAD - Cognitive Radio

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit:	739 - TSC - Department of Signal Theory and Communications
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	2
Teaching languages:	Catalan, Spanish

Teaching staff

Coordinator:	Casadevall Palacio, Fernando-Jose
Others:	Casadevall Palacio, Fernando-Jose

Opening hours

Timetable:	Tuesday 10 to 12 am
	Thursday 12 am to 2 pm

Prior skills

Knowledge of mobile communications

Requirements

Per GR ENG SIST TELECOM
RADIOCOMMUNICATIONS - Corequisite
Per GR ENG TELEMÀTICA
MOBILE COMMUNICATIONS SUPPORT SYSTEMS- Corequisite
Per GR CIÈNC I TECN TELE
RADIOCOMMUNICATIONS - Corequisite

Degree competences to which the subject contributes

Generical:

09 CSCT N3. ABILITY TO CONCEIVE, DESIGN, IMPLEMENT AND OPERATE COMPLEX ICT SYSTEMS. Level 3. To identify market needs and opportunities. To collect information to prepare specifications for a new product, process or service. To prepare a basic business plan. To conceive a new product, process or service. To develop and implement planning of a design process. To carry out the various phases of the design process.

Transversal:

07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

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Teaching methodology

Lecturers

Laboratory activities

Learning objectives of the subject

Most of the today's Wireless System are allocated in spectrum bands devoted for exclusive use of licensed users (licensed bands). Technological advancement has resulted in the huge development of personal wireless technologies. As the result spectrum scarcity happens. A solution to this problem is to let unlicensed users use the licensed frequencies, provided they can guarantee interference perceived by the primary license holders will be minimal. This new concept is called Cognitive Radio.

In this seminar you will know and understand the concept of:

- Cognitive Radio and their applications and limitations
- TV White Spaces and applications
- Dynamic spectrum management, particularly the LSA (Licensed Shared Access) concept

Study load

Total learning time: 50h	Hours large group:	20h	40.00%
	Self study:	30h	60.00%

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Content

Cognitive Radio: The smart radio of the next future

Learning time: 20h

Theory classes: 20h

Description:

Topic 1 - Introduction

- 1.1 Reasons for the deployment of Cognitive Radio:
 - 1.1.1 Evolution in terms of users and data traffic of mobile communication systems.
 - 1.1.2 Capacity fundamental limits of the transmission systems.
 - 1.1.3 Available band: Spectrum measurements in BCN
- 1.2 Evolution of cellular systems and wireless mobile communications.
- 1.3 Cognitive Radio concept
- 1.4 Possible wireless and cellular applications.

Topic 2 - Cognitive Radio Properties

- 2.1 Cognitive Radio Concept
- 2.2 Functionalities. Concept Cognitive level:
 - 2.2.1 Spectrum Awareness
 - 2.2.2 Spectrum Selection
 - 2.2.3 Spectrum Sharing
 - 2.2.4 Mobility Spectrum
- 2.3 Structure of Cognitive Transceiver

Topic 3 - Spectrum Awareness Techniques

- 3.1 Spectrum Sensing techniques : Classification and performances
- 3.2 Databases (REM-Radio Environmental Maps)
- 3.3 Cognitive Pilot Channel

Topic 4 - TV White Spaces

- 4.1 Concept and scenarios
- 4.2 Architectures
- 4.3 Procedures and functionalities
- 4.4 Standardization
 - 4.4.1 Description of the standard IEEE 802.22

Topic 5 ? Models of the spectrum usage

- 5.1 Methodologies for spectrum measurements
- 5.2 Time, Frequency and Space models

Qualification system

Continuous assessment 50% of the final score

Final exam 50% of final score

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Bibliography

Basic:

Venkataraman, H.; Muntean, G.-M. (eds). Cognitive radio and its application for next generation cellular and wireless networks [on line]. 2012. Dordrecht: Springer, 2012 [Consultation: 10/10/2018]. Available on: <<https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=971413>>. ISBN 9789400718272.

Xiao, Y.; Hu, F. (editores). Cognitive radio networks [on line]. 2009. Boca Raton: CRC Press, 2009 [Consultation: 10/10/2018]. Available on: <<https://ebookcentral.proquest.com/lib/csuc-ebooks/detail.action?docID=381346>>. ISBN 9781420064209.

Others resources:

Audiovisual material

- Transparències del seminari

- Seminari slides