Course guides
230709 - 5GMCS - 5G Mobile Communications Systems

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.
Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Optional subject).

Academic year: 2020  ECTS Credits: 5.0  Languages: English

LECTORER
Coordinating lecturer: Perez Romero, Jorge
Others: Perez Romero, Jorge

PRIOR SKILLS
Basic knowledge of wireless communications

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE2. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.

Transversal:
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY
- Lectures
- Team work
- Oral presentations
- Mid-term exam
- Final exam
LEARNING OBJECTIVES OF THE SUBJECT

- Present the mobile communications systems that compose the so-called 5th Generation (5G) resulting from the evolution of LTE technology and the integration of the new radio interface (5G New Radio).
- Analyze the characteristics and functionalities of 5G systems to provide services to new application domains, such as Internet of Things, vehicular communications, etc.

Learning results of the subject:
- Ability to analyse, model and design and implement the newest architectures, protocols and communication interfaces for mobile communication systems.
- Ability to analyse, model and apply advanced mobile communication techniques.

(Note: Until the course 2017/18 this subject was offered under the title "Advanced Mobile Communications" and it has evolved to incorporate the 5G systems.)

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>39,0</td>
<td>31.20</td>
</tr>
<tr>
<td>Self study</td>
<td>86,0</td>
<td>68.80</td>
</tr>
</tbody>
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Total learning time: 125 h

CONTENTS

1.- Introduction

Description:
1.1.- Mobile Communications technology evolution
1.2.- Drivers to increase network capacity
1.3.- 5G requirements and use cases
1.4.- Standardisation process

Full-or-part-time: 8h
Theory classes: 3h
Self study : 5h

2.- Long Term Evolution (LTE)

Description:
2.1.- Architecture
2.2.- Procedures
2.3.- Radio interface
2.4.- LTE-Advanced (LTE-A)

Full-or-part-time: 46h
Theory classes: 14h
Self study : 32h
3.- LTE evolution towards 5G

**Description:**
3.1.- LTE Advanced Pro
3.2.- Support for IoT
3.3.- Vehicular communications (V2X)
3.4.- eMBMS

**Full-or-part-time:** 22h
Theory classes: 7h
Self study: 15h

4.- 5G system

**Description:**
4.1.- Reference architecture
4.2.- Network functions and interfaces of the 5G Core
4.3.- NG-RAN
4.4.- QoS model and procedures
4.5.- Support for Network Slicing

**Full-or-part-time:** 22h
Theory classes: 7h
Self study: 15h

5.- 5G New Radio (5G NR)

**Description:**
5.1.- Radio interface protocol stack
5.2.- Physical layer characteristics
5.3.- Logical, transport and physical channels
5.4.- Procedures

**Full-or-part-time:** 27h
Theory classes: 8h
Self study: 19h

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**GRADING SYSTEM**

Team work: 25%
Mid-term exam: 30%
Final exam: 45%

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**BIBLIOGRAPHY**

**Basic:**
Complementary:

RESOURCES

Other resources:
Slides of the subject