Last update: 06-05-2019

230709 - 5GMCS - 5G Mobile Communications Systems

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering

Teaching unit: 739 - TSC - Department of Signal Theory and Communications

Academic year: 2019

Degree: MASTER'S DEGREE IN ADVANCED TELECOMMUNICATION TECHNOLOGIES (Syllabus 2019). (Teaching unit Optional)
MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: 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.

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(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

Total learning time: 125h	Hours large group:	39h	31.20%
	Self study:	86h	68.80%

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Content

1.- Introduction

Learning time: 8h

Theory classes: 3h
Self study : 5h

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

2.- Long Term Evolution (LTE)

Learning time: 46h

Theory classes: 14h
Self study : 32h

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

3.- LTE evolution towards 5G

Learning time: 22h

Theory classes: 7h
Self study : 15h

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

4.- 5G system

Learning time: 22h

Theory classes: 7h
Self study : 15h

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

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5.- 5G New Radio (5G NR)	Learning time: 27h Theory classes: 8h Self study : 19h

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

Qualification system

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

Bibliography

Basic:

Dahlman, E.; Parkvall, S.; Skold, J. 5G NR: the next generation wireless access technology. Amsterdam: Academic Press, 2018. ISBN 9780128143230.

Marsch, P.; Bulakci, Ö.; Queseth, O.; Boldi, M. 5G system design: architectural and functional considerations and long term research. Hoboken, New Jersey: Wiley, 2018. ISBN 9781119425120.

Agustí, R.; Bernardo, F.; Casadevall, F.; Ferrús, R.; Pérez-Romero, J.; Sallent, O. LTE: nuevas tendencias en comunicaciones móviles. Fundación Vodafone España, 2010. ISBN 8493474045.

Complementary:

Dahlman, E.; Parkvall, S.; Skold, J.; Beming, P. 3G evolution: HSPA and LTE for mobile broadband. 2nd ed. Amsterdam: Elsevier, 2008. ISBN 9780123745385.

Others resources:

Slides of the subject