Program	59SC –Telecommunications Systems Engineering B. Eng.

Course code and name	
Code	595010342
Name	Mobile Communications
Semester	S7 [(September-January)]

Credits and contact hours	
ECTS Credits	4,5
Contact hours	46

Coordinator's name	Pérez Yuste, Antonio [antonio.perez@upm.es]

Specific course information

Description of course content

This course is intended for senior undergraduate students in telecommunication systems engineering who wish to be acquaintance with the state of the art on both modern land mobile communication systems, like LTE and 5G, and broadband wireless data networks, like WiFi and BLE.
Fundamental concepts of cellular systems, mobile wireless channel, and wireless networks and systems will be examined. A number of practical abilities will be developed through some hands-on guided activities.

List of topics to be covered

Theory classes
- T1. Introduction to wireless communications
- T2. Cellular systems foundations
- T3. The wireless channel
- T4. Broadband mobile communications: 4G-LTE
- T5. The Road to 5G
- T6. Broadband wireless data networks
- T7. Closing conference and survey

Workshop classes
- W1. Wireless spectrum for mobile communications in Spain
- W2. Radio planning using XIRIO

Laboratory classes
- L1. LTE Vienna Simulator
- L2. WiFi measurements with Ekahau

Prerequisites or co-requisites	
Theory of Communications Wave Transmission and Propagation Telecommunication Systems	
Course category in the program	
☐ **R (required)**	☑ **E (elective)** *(elective courses may not be offered every year)*

Specific goals for the course

Specific outcomes of instruction

RA284 – Design and planning of systems and networks for wireless communications.
RA285 – Use of processes and techniques of measurement and characterization of these systems and of the involved communication components.
RA281 – Calculation of the link balances and of the wireless communications systems quality.
RA282 – Description and comparison of the main wireless digital communication systems in Europe (TETRA, GSM/GPRS, UMTS, LTE), including the architecture, the services, the interfaces and the layers (specially the radio interface).
RA283 – Analysis of the structure of bursts and correlations and of the codification and modulation processes.
RA280 – Analysis and simulation of a mobile channel and of the propagation models.

Further reading and supplementary materials

Textbooks:

- Rappaport, T.S., Wireless Communications: Principles and Practice, 2nd ed. (Prentice-Hall, 2002)
- Cox, C., An Introduction to LTE (John Wiley & Sons, West Sussex, UK, 2012)
- Cox, C., An Introduction to 5G. The New Radio, 5G Network and Beyond (John Wiley & Sons Ltd, UK, 2022).
- Dahlman, E. 4G, LTE-Advanced Pro and The Road to 5G, 3ª ed. (Academic Press, 2016)
- Dahlman, E. et al., 5G NR: The Next Generation Wireless Access Technology (Academic Press, 2018)
- Du, K.L and Swamy, M.N.S. Wireless Communication Systems (Cambridge University Press, New York, 2010)
- José M. Hernando et al., Comunicaciones Móviles, 3ª ed (Centro de Estudios Ramón Areces, Madrid, 2015)

Webpages:

- The International Telecommunications Union (ITU): http://www.itu.int
- The 3rd Generation Partnership Project (3GPP): http://www.3gpp.org/
- IEEE 802.11, wireless local area networks (IEEE): http://www.ieee802.org/11/

Teaching methodology			
_X_ **lectures**	__ **problem solving sessions**	__ **collaborative actions**	_X_ **laboratory sessions**

Other:	Moodle online platform is used in this course and represents the main resource for students. Absolutely all the information and materials, as well as the evaluation tools, can be found in this site. Theory classes are given in a standard classroom, while lab practices are conducted on-site at special department facilities or at a distance by using specific software.