

Program	59EC – Communications Electronic Engineering B. Eng. 59SC – Telecommunications Systems Engineering B. Eng. 59SO – Sound and Image Engineering B.Eng. 59TL – Telematics Engineering B. Eng.
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Course number and name	
Number	595000234, 595020234, 595023234, 595021234
Name	Mobile Communications Networks
Semester	S7 [(September-January)]

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	Ramos Nespereira, Carlos [carlos.ramosn@upm.es]
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Specific course information
Description of course content
The main goal of the course is to analyze the network structure, the protocol architecture and the characteristics and services of mobile networks, through a chronological study of networks with 2G technologies (GSM / GPRS / EDGE), 3G (UMTS / HSDPA / HSUPA) and 4G (LTE / LTE-Advanced) with a brief introduction to the 5G technology.
List of topics to be covered
<ol style="list-style-type: none"> 1. Introduction to cellular mobile systems. 2. GSM Systems: GSM, GPRS, EDGE. 3. 3G Systems: UMTS, HSDPA, HSUPA. 4. 4G/5G systems: LTE, LTE-Advanced, 5G. <p>Lab sessions:</p> <ol style="list-style-type: none"> 1. Analysis of traffic and protocols in GSM networks: GSM, GPRS, EDGE. 2. Analysis of traffic and protocols in 3G networks: UMTS, HSDPA, HSUPA. 3. Protocol configuration and analysis in an LTE network.
Prerequisites or co-requisites
<ul style="list-style-type: none"> – Telecommunication Networks and Services – Computer Networks – Signaling and Switching

Specific goals for the course
Specific outcomes of instruction
<ul style="list-style-type: none"> • RA212 - Ability to apply techniques that are based on networks, services and telematics applications in mobile environments, local and wide area, with

different bandwidths and including telephony and data, systems management, signaling and switching, routing and routing and quality of service.

- RA349 - Ability to describe the basic characteristics of cellular mobile systems.
- RA360 - Ability to identify emerging technological alternatives in 4G.
- RA353 - Ability to explain the structures of protocols on GSM/GPRS/EDGE interfaces.
- RA351 - Ability to justify functional improvements between 2G technologies.
- RA357 - Ability to detail the functionality of the elements of architecture in the 3G network: UMTS/HSDPA/HSUPA.
- RA350 - Ability to establish a chronological classification comparison of mobile communications systems.
- RA355 - Ability to relate messages signaling with the services of the level of link and the logical channels defined in the networks GSM/GPRS/EDGE radio interface.
- RA356 - Ability to explain technical and functional improvements among the 3G technologies.
- RA223 - Ability to advance with the technological progress in mobile environments both local and wide area in order to improve networks and telematic services.
- RA354 - Ability to identify the functionality of control messages exchanged in the networks GSM/GPRS/EDGE radio interface.
- RA358 - Ability to describe the interfaces and network protocols UMTS/HSDPA/HSUPA.
- RA359 - Skill of linking the kind and quality parameters of service in UMTS.
- RA352 - Ability to describe the functionality of the architecture elements of GSM mobile networks: GSM, GPRS, EDGE.
- RA219 – Skill of building and exploiting the networks, services and telematics applications.
- RA735 – Skill of describing the interfaces and protocols in LTE networks.
- RA213 – Ability to advance with the technological progress in the areas of transmission, switching and processing in order to improve networks and telematic services.
- RA214 – Ability to design and implement a communication network using the current systems, rules and recommendations for the telecommunications.
- RA734 - Ability to describe the functionality of the architecture elements of a LTE network.
- RA736 - Ability to analyze the basic procedures of a LTE network.

Further reading and supplementary materials

- Hernando Rábanos, José M. Comunicaciones móviles (2ª edición). Ed. Centro de Estudios Ramón Areces, 2004.
- Lluch Mesquida, Cayetano. Comunicaciones móviles de tercera generación UMTS. Ed. Telefónica Móviles España, Madrid, 2000.
- Cox, Christopher. Essentials of UMTS. Ed. Cambridge University Press, New York, 2008.
- Kaaranen, Heikki. UMTS Networks: architecture, mobility and services (2nd Ed.).

- Ed. John Wiley & Sons, 2005.
- Kreher, Ralf. UMTS signaling: UMTS interfaces, protocols, message flows and procedures analyzed and explained (2nd Ed.). Ed. John Wiley & Sons, 2007.
 - Huidobro Moya, José Manuel. Comunicaciones móviles: GSM, UMTS, LTE?. Ed. Ra-Ma Madrid, 2012.
 - Holma, Harri. WCDMA for UMTS: HSPA Evolution and LTE. 5ª Ed. Ed. Wiley, 2010.
 - UMTS Forum. <http://www.umtsforum.org/>
 - The 3rd Generation Partnership Project (3GPP). <http://www.3gpp.org/>
 - Moodle.