

SUBJECT TEACHING GUIDE

G848 - Wireless Networks

Degree in Telecommunication Technologies Engineering
 First Degree in Telecommunication Technologies Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering First Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3 Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Communications Network Architecture				
Course unit title and code	G848 - Wireless Networks				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web	https://www.tlmat.unican.es/index.php?l=es&p=teaching&s=subjects&ss=g_ri&				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES				
Name of lecturer	LUIS MUÑOZ GUTIERREZ				
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Other lecturers	MARTA GARCIA ARRANZ LUIS FRANCISCO DIEZ FERNANDEZ				

3.1 LEARNING OUTCOMES

- The student will be able to understand and predict the main consequences linked to the radio propagation channel. The performance of digital cellular systems will be evaluated according to the network architecture design. With this background the student will be able to conceive and design future cellular networks based on the requirements imposed by both the users and the services.

4. OBJECTIVES

The following objectives are addressed:

- 1) The radio channel and its limitations.
- 2) Analysis of the efficiency of radio resource sharing techniques in wireless networks .
- 3) Cellular access networks capacity analysis.
- 4) Understanding the concept of logical channel and its mapping onto physical resources.
- 5) To apply the above concepts to GSM and GPRS systems.
- 6) Analysis of cellular systems based on CDMA techniques .
- 7) CDMA techniques as the basis for 3G and 3,5G.
- 8) To understand the needs, limitations and possibilities of short range wireless communications.
- 9) The IEEE 802.11x family: Standards and evolution.

6. SUBJECT PROGRAM

CONTENTS

1	Introduction to mobile communication systems. Basic concepts on propagation. Flat-earth model. Fading. Radio engineering techniques. Radio resource sharing techniques. The concept of cellular system. Capacity of cellular systems. Fundamentals of cellular network planning.
2	The GSM system. Requirements for a global cellular digital system. Initial proposal. GSM architecture. Constitutive modules and functionalities. The radio interface. Bursts. The GSM logical channel concept. Mapping logical channels onto physical resources. Type of combinations. Planning GSM networks. Call establishment and network association.
3	The GPRS system. The need for supporting mobile data. GSM evolution for supporting data services: SGSN and GGSN. The GPRS radio interface.
4	CDMA techniques. Spread spectrum techniques review. Beyond TDMA and TDMA/FDMA schemes. The radio channel and spread spectrum techniques. RAKE receiver. Sharing resources with CDMA. Capacity analysis of CDMA systems. Cell breathing effect.
5	The IMT-2000 system. Evolution from 2G to 3G. Requirements. Standardization: 3GPP and working groups. UMTS architecture. UTRA-FDD. Transport, logical and physical channels. Mapping onto physical resources. The path from 3G to 4G. HSDPA and HSUPA. Introduction to LTE-A.
6	Wireless local area networks. Needs and requirements. The standardization process. Introduction to the IEEE 802.11x physical and MAC layers.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Partial exam-1	Written exam	No	Yes	30,00
There will be an exam related to the laboratory sessions. Its contribution to the continuous evaluation will be a 10%.	Laboratory evaluation	Yes	No	10,00
Partial exam -2	Written exam	No	Yes	30,00
Partial exam-3	Written exam	No	Yes	30,00
TOTAL				100,00
Observations				
The students passing the three partial exams will pass the subject. However, if anyone wants to improve the mark they can attend to the ordinary examination session. In this case the final mark will be the maximum of (FEM; $FEM \cdot 0.60 + CEM \cdot 0.40$). FEM: Final Evaluation Mark/CEM: Continuous Evaluation Mark. The students not attending the lectures or deciding not to participate in the continuous evaluation will obtain the mark corresponding to the final exam.				
Observations for part-time students				
The students not attending the lectures or deciding not to participate in the continuous evaluation will obtain the mark corresponding to the final exam.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
The GSM System for Mobile Communications; Autores: Michel Mouly, Marie-Bernadette Pautet. An Introduction to GSM; Autores: Siegmund M. Redl, Matthias K. Weber; Malcolm W. Oliphant; Editorial: Artech House. GPRS: Gateway to Third Generation Mobile Networks; Autores: Gunnar Heine; Holger Sagkob; Editorial: Artech House. UMTS: The Fundamentals; Autores: B. Walke; P. Sidenberg; M.P. Althoff; Editorial: John Wiley.