SUBJECT TEACHING GUIDE

G816 - Communications 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	Compulsory. Year 2 Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Networks and Data Communication Module in Common with the Telecommunications Branch				
Course unit title and code	G816 - Communications Networks				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	http://www.tlmat.unican.es				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
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Other lecturers	ROBERTO SANZ GIL LUIS FRANCISCO DIEZ FERNANDEZ

3.1 LEARNING OUTCOMES
- Knowledge of some basic concepts on communication networks: multiplexing, switching and routing.
- Algorithm design; applicability on network routing.
- Modeling of network dimensioning problems by means of teletraffic concepts
- Knowledge of basic network planning techniques

4. OBJECTIVES

The main goal of this course is to adquire the basic knowledge about telecommunication systems, in particular the following ones: switching, multiplexing. Introduction to routing in communication networks. Routing algorithms and protocols. Teletraffic. Queuing Theory and mathematical modeling. Loss systems. System dimensioning. Introduction to cellular networks. Cellular system dimensioning.

6. SUBJECT PROGRAM

CONTENTS	
1	Part 1 - Introduction Network concept. Telephone network: (1) the road to the digital network; (2) Last-mile. Multiplexing: (1) Static resorce sharing: FDMA, TDMA, CDMA. Network hierarchies: PDH, SDH. Switching: (1) circuit; (2) packet (datagram and virtual circuit)
2	Part 2 - Network algorithms Routing: minimum cost: Dijkstra, Bellman-Ford, Floyd-Warshall. Additional algorithms: (1) Minimum Spanning Tree: Prim, Kruksal; (2) Maximum Flow: Ford-Fulkerson.
3	Part 3.1 - Introduction to teletraffic Introduction to teletraffic and queuing theory. Poisson model. Little's law.
4	Part 3.2 - Teletraffic: application to system dimensioning. Birth and death processes. Pure loss systems: ErlangB. Non-loss systems: ErlangC. Network dimensioning.
5	Part 4 - Cellular Mobile Networks Introduction to the mobile telephone systems. Evolution to cellular networks. Cellular planning and interference. Cellular systems.
6	Ordinary final exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Three individual (per lesson) evaluation per term.	Written exam	No	No	25,00
Lab assignment evaluation withe multiple choice exams.	Laboratory evaluation	Yes	No	12,50
Ordinary final exam.	Written exam	Yes	Yes	50,00
Assignment reports	Work	Yes	No	12,50
TOTAL				100,00

Observations

The final qualification is obtained by means of the following expression, in which TEOR is the one corresponding to the theory part of the course and PRAC corresponds to lab assigments.
NOTA = TEOR*0.75 + PRAC*0.25

The theory qualification is obtained from the individual (per lesson) exams (EC) and the final ordinary exam (EF). Furthermore, the EC does not jeopardize the final qualification, and therefore:
TEOR = max(0.66 * EF + 0.34 * EC ; EF)

Lab assignments are compulsary, and the corresponding qualification is obtained by means of the lab exams (two will be scheduled during the course): TEST_PRAC and the reports that should be delivered for each of them: MEM_PRAC:
PRAC = 0.5 * MEM_PRAC + 0.5 * TEST_PRAC

In any case, a minimum mark of 4.0 is required in the final exam; otherwise the final course qualification would be the minimum between the previous one (NOTA) and 4.9, according to current evaluation rules at University of Cantabria
IF EF < 4
NOTA_FIN = min(NOTA; 4.9)
ELSE
NOTA_FIN = NOTA

When the course is not passed after the ordinary final exam, the rest of qualifications (lab assignments, individual exams) will be kept only until the extraordinary exam.

On the other hand, we might consider an on-line evaluation of assignments, lab assignments and written examns if a new health alert is called, similar to the one caused by the COVID-19 pandemic, and a regular in-class evaluation is not possible.

Under the circumstance that we need to adapt the lecturing to an on-line methodology, the students might be required to explain of the qualification items (exams or reports) they have delivered.

Observations for part-time students

The participation in lab assignments is compulsary. Several groups are established to favor the attendance of all students.
The individual (per-lesson) evaluation is optional; the qualification of the theoretical part of the course (TEOR) would that of the final exam for those students not taking the individual tests.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Flood, John E. "Telecommunications switching, traffic and networks". Prentice Hall.

Schwartz, Mischa. "Telecommunication networks: protocols, modeling, and analysis". Prentice Hall.

Tanenbaum, Andrew S. "Computer Networks". Pearson.