

SUBJECT TEACHING GUIDE

G816 - Communications Networks

Degree in Telecommunication Technologies Engineering

Academic year 2019-2020

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|--|------------------|--------------------|------------------|--------------------|
| Degree | Degree in Telecommunication Technologies Engineering | | | Type and Year | 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.timat.unican.es | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

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|------------------|---|--|--|--|--|
| Department | DPTO. INGENIERIA DE COMUNICACIONES | | | | |
| Name of lecturer | RAMON AGÜERO CALVO | | | | |
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| Office | Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 2. DESPACHO (S228) | | | | |
| Other lecturers | ROBERTO SANZ GIL LUIS FRANCISCO DIEZ FERNANDEZ | | | | |

| 3.1 LEARNING OUTCOMES |
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| - 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 acquire 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. COURSE ORGANIZATION

CONTENTS

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| 1 | Part 1 - Introduction Network concept. Telephone network: (1) the road to the digital network; (2) Last-mile. Multiplexing: (1) Static resource 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, Kruskal; (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 | 30,00 |
| Lab assignment evaluation. | Laboratory evaluation | No | No | 20,00 |
| Ordinary final exam. | Written exam | Yes | Yes | 50,00 |
| TOTAL | | | | 100,00 |

Observations

Lab assignments are compulsory.

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 assignments.

$$NOTA = TEOR \cdot 0.8 + PRAC \cdot 0.2$$

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:

$$TEOR = \max\{0.6 \cdot EF + 0.4 \cdot EC ; EF\}$$

In any case, a minimum mark of 4.0 is required in the final exam; otherwise the final course qualification would be that of that exam (IF $EF < 4$, $NOTA = EF$), keeping the rest of qualifications only until the extraordinary September exam.

Observations for part-time students

The participation in lab assignments is compulsory. 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.