SUBJECT TEACHING GUIDE

G846 - Network Dimensioning and Planning

Degree in Telecommunication Technologies Engineering

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Communications Network Architecture				
Course unit title and code	G846 - Network Dimensioning and Planning				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	http://www.tlmat.unican.es				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
Name of lecturer	RAMON AGÜERO CALVO
E-mail	ramon.agueroc@unican.es
Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 2. DESPACHO (S228)
Other lecturers	LUIS FRANCISCO DIEZ FERNANDEZ

3.1 LEARNING OUTCOMES
- Application of Markov chain based models for the analysis and dimensioning of various communication systems.
- Abstraction of real system characteristics; analysis of their performance and behaviour by means of models.
- Advanced aspects on the implementation and use of routing (and other networking) algorithms over real use cases in the networking realm
- Network planning and performance evaluation.

4. OBJECTIVES

The course will introduce the application of Markov-chain based models to analysis the performance of communication networks.

In particular, it will study M/M/1 systems and their extensions; queuing system networks; pure loss systems; finite source models. In all cases, real examples will be used so that the student can appreciate the modeling usefulness.

The course will also introduce advanced aspects on the implementation of routing (and others) algorithms over graphs. Some examples on its application over real networks will be discussed.

6. COURSE ORGANIZATION

CONTENTS	
1	Part 0 - Introduction. Service and network models. Fixed and mobile networks. Access and core networks.
2	Part 1 - Graph theory: basic concepts. Algorithm complexity. Basic graph concepts. Graph representation. Basic graph algorithms.
3	Part 2 - Graph algorithms. Mínimum-cost path problema. P-Median (Warehouse Location) problem. Travelling Salesman Problem. Applications.
4	Part 3 - M/M/1 model and extensions. Source models. M/G/1 model. M/G/1 with priorities.
5	Part 4 - M/M/S/S model and extensions. Pure Loss systems. Multiple services. Extended ErlangB formula.
6	Part 5 - Finite source systems. Non-loss (infinite buffer) systems. Loss systems. Engset formula.
7	Part 6 - Queuing system networks. Packet switching networks (M/M/1 models).
8	Ordinary final exam

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Lab assignments	Work	No	No	30,00
Ordinary final exam	Written exam	Yes	Yes	50,00
Individual (every two-lessons) exams	Written exam	No	No	20,00
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*0.7 + PRAC*0.3
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{ 0.7 * EF + 0.3 * EC ; EF}
The exams might consist on short questions (multiple-choice) or problems.
Lab assignments are compulsary. The qualification of this part is based on a number of deliverables that students need to prepare (groups of 3/4 people).
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 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
L. Kleinrock. Queueing systems. John Wiley
M. Schwartz. Telecommunication networks : protocols, modeling, and analysis. Addison Wesley