Course guide
230153 - PX - Planning Communications Networks

Last modified: 09/11/2022

Unit in charge:	Barcelona School of Telecommunications Engineering
Teaching unit:	744 - ENTEL - Department of Network Engineering.

Degree:	BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2022   **ECTS Credits:** 6.0   **Languages:** Spanish

LECTURER

Coordinating lecturer:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS

Knowledge acquired in: Introduction to Telematic Networks, Analysis and Evaluation of Networks.

REQUIREMENTS

NETWORK ANALYSIS AND EVALUATION - Precorequisite

TEACHING METHODOLOGY

- Lectures
- Exercises
- Long-answer questions
- Other activities

LEARNING OBJECTIVES OF THE SUBJECT

Planning networks is a complex task. At least two components must be considered. First, the technologycal aspects involved and second, the economy constraints. The word "networks" is associated with two different terms: the core network and the access network. The last one is everywhere in our lifes and today is the most important part of the analysis on networks. Of course, the performance evaluation of each type of networks presents different kinds of tools to tackle on.

In the process of planning networks it is necessary to distinguish two phases: the first one is the design phase and the second one is the operation phase. In the desing phase, the designer get the optimal topology of the network in the aim to obtain for a limited budget, for example, the minimum time to transmit packets through the network. But in this process some question are coming up, for example, how to buy the BW for the core or access network? Is it possible to buy this BW in advance? In this case, how much to pay for it?

In the operation phase it is important to monitor the network, what imply to know what type of metrics and measures and in which scenarios should be taken. Thus, the monitoring of the network allows the designer of the network to assign the available resources in an optimal way to match the required services. Some of this services could be for example Data Base access, multimedia web applications, IPTV with Netflix, etc.

Wireless access networks play a fundamental role today. These networks have certain difficulties that can be improved with appropriate technologies. Here, it is described the algorithm DPC (Distributed Power Control) and the advantages of access mechanisms used in WIFI.

STUDY LOAD

Type	Hours	Percentage
Hours large group	52,0	34.67
Self study	98,0	65.33

Total learning time: 150 h

CONTENTS

1. Core Network. Technological design aspects

Description:
- Capacity assignment for links. Minimax criterium.
- Quality parameters: monitoring and operation.
- Network reliability. Ford-Fulkerson algorithm.

Full-or-part-time: 28h 50m
Theory classes: 10h
Self study : 18h 50m

2. Economic constraints in the design phase

Description:
- Decisions in uncertain scenarios. Options and futures.
- Expectations of returns and volatility. Binomial trees. Pricing options.
- Case study: Pricing spectrum options.

Full-or-part-time: 20h 11m
Theory classes: 7h
Self study : 13h 11m

3. Access Network. Technological design aspects

Description:
- DPC (Distributed Power Control) Algorithm
- Access Network Evaluation using WIFI

Full-or-part-time: 23h 06m
Theory classes: 8h
Self study : 15h 06m

4. Performance engineering in telematics systems. Operational analysis

Description:
- Evaluation metrics.
- Evaluation tools:
- Queuing Networks.
- Markov Models
- Mean Value Analysis Method
- Application cases: Web aplications, Data base access, etc.

Full-or-part-time: 72h 06m
Theory classes: 25h
Self study : 47h 06m

ACTIVITIES

First Part Exam

Description:
Exercises.

Full-or-part-time: 2h
Theory classes: 2h

Second Part Exam

Description:
Exercises.

Full-or-part-time: 2h
Theory classes: 2h

GRADING SYSTEM

- Lessons 1, 2 and 3: Exam 30%, Continuous Assessment 20%
- Lesson 4: Exam 30%, Continuous Assessment 20%

BIBLIOGRAPHY

Basic:
- Hull, J.C. Options, futures, and other derivatives. 9th ed.; global ed. Harlow: Pearson, 2015. ISBN 9780133456318.
- Osborne, M.J. An introduction to game theory. Int. ed. New York: Oxford University Press, 2009. ISBN 9780195322484.
- Menasce, D.A.; Almeida, V.A.F.; Dowdy, L.W. Performance by design: computer capacity planning by example. Upper Saddle River: Prentice Hall PTR, 2004. ISBN 0130906735.

Complementary:
- Trigeorgis, L. Real options: managerial flexibility and strategy in resource allocation. Cambridge (Mass.): MIT Press, 1996. ISBN 026220102X.
- Roman, S. Introduction to the mathematics of finance: arbitrage and option pricing [on line]. 2nd ed. New York: Springer, 2012 [Consultation: 30/06/0022]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=972639. ISBN 9781461435822.
- Leyton-Brown, K.; Shohan, Y. Essentials of game theory: a concise multidisciplinary introduction [on line]. San Rafael: Morgan and

Claypool, 2008 [Consultation: 30/06/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/reader.action?docID=881033. ISBN 9781598295931.

- Chiang, M. Networked life : 20 questions and answers [on line]. Cambridge ; New York: Cambridge University Press, 2012 [Consultation: 30/06/2022]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1025055. ISBN 9781139570145.