

## 230153 - PX - Planning Communications Networks

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit:	744 - ENTEL - Department of Network Engineering
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Spanish

### Teaching staff

Coordinator:	MARCOS POSTIGO BOIX
Others:	JOSÉ LUIS MELÚS MORENO MARCOS POSTIGO BOIX

### Prior skills

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

### 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 technological 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 lives 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.



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### Study load

Total learning time: 150h	Hours large group:	52h	34.67%
	Self study:	98h	65.33%

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### Content

<p>1. Core Network. Technological design aspects</p>	<p>Learning time: 28h 50m Theory classes: 10h Self study : 18h 50m</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>- Capacity assignment for links. Minimax criterium.</li> <li>- Quality parameters: monitoring and operation.</li> <li>- Network reliability. Ford-Fulkerson algorithm.</li> </ul>	
<p>2. Economic constraints in the design phase</p>	<p>Learning time: 20h 11m Theory classes: 7h Self study : 13h 11m</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>- Decisions in uncertain scenarios. Options and futures.</li> <li>- Expectations of returns and volatility. Binomial trees. Pricing options.</li> <li>- Case study: Pricing spectrum options.</li> </ul>	
<p>3. Access Network. Technological design aspects</p>	<p>Learning time: 23h 06m Theory classes: 8h Self study : 15h 06m</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>- DPC (Distributed Power Control) Algorithm</li> <li>- Access Network Evaluation using WIFI</li> </ul>	
<p>4. Performance engineering in telematics systems. Operational analysis</p>	<p>Learning time: 72h 06m Theory classes: 25h Self study : 47h 06m</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>- Evaluation metrics.</li> <li>- Evaluation tools: <ul style="list-style-type: none"> <li>- Queuing Networks. <ul style="list-style-type: none"> <li>- Markov Models</li> <li>- Mean Value Analysis Method</li> </ul> </li> </ul> </li> <li>- Application cases: Web applications, Data base access, etc.</li> </ul>	

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### Planning of activities

First Part Exam	Hours: 2h Theory classes: 2h
Description: Exercises.	
Second Part Exam	Hours: 2h Theory classes: 2h
Description: Exercises.	

### Qualification 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:

- Chiang, M. Networked life : 20 questions and answers [on line]. Cambridge ; New York: Cambridge University Press, 2012 [Consultation: 03/10/2018]. Available on: <<https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1025055>>. ISBN 9781139570145.
- 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: 03/10/2018]. 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. San Rafael: Morgan and Claypool, 2008. ISBN 9781598295931.