30320 - Network Planning and Sizing

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	438 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS	6.0
Course	3
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

5.2.Learning activities

5.3.Program

The program that the student is offered to achieve the expected results includes the following activities ...

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Theoretical / practical sessions whose main contents are organized into the following thematic units:

Unit 0. Introduction.
Presentation of the subject. Introduction to the problem of planning, dimensioning and analysis of communications networks.

Unit 1. Mathematical tools

- Evaluation based on mathematical models. Queueing Theory: General characteristics, types of problems and notation. Kendal notation. Evaluation objectives and related parameters.
- Little's law.
- Models based on Markov chains. Statistical modeling. Markov processes. Discrete-Time Markov chains. Solution and properties. Continuous time Markov chains. Solution and properties.
- Arrival Process characterization. Poisson processes. Pure birth process continuous in time. Binomial process. Pure birth processes discrete in time. PASTA Principle.
- Time Service Characterization.
  Traffic characterization. On-Off Sources. N On-Off sources.
- Performance analysis. M/M/1 Queue. M/D/1 Queue.

Unit 2. Analysis of media access methods in broadcast networks

- Performance analysis of random access protocols. ALOHA, Slotted ALOHA, CSMA, CSMA-CD.

Unit 3. Dimensioning of circuit-switched networks

- Dimensioning of transport networks. Fixed networks problems. Links dimensioning and switch design.
- Dimensioning of blocking circuit-switching systems. Erlang B. Infinite servers systems. Application examples.
- Overflow systems.
- Dimensioning of circuit-switching systems with queues. Erlang C.
- Dimensioning of circuit-switching systems with finite population.
- Switch design. Fundamentals of design by analysis of blocking probability.

- Planning and dimensioning of mobile cellular networks.

Unit 4. Dimensioning of packet-switching networks

- Transport links dimensioning. Overview of M/M/m system.
- Process analysis with generic time service. Semi-Markovian systems. Evaluation of M/G/1 queue. M/G/1 system with holidays. Application to the analysis of protocol error recovery, access protocols.
- Analysis of systems with traffic priorities. M/G/1 system priorities. Preemptive and non-preemptive priorities.
- Networks of markovian queues. Queues in tandem. Burke's theorem.
  Kleinrock's principle of independence. Feedback systems.
- Planning and dimensioning of packet-switching networks. Mean network delay estimation.

Unit 5. Application of queuing theory to traffic control.

- Application of queuing theory to traffic control, admission and traffic regulation.

Laboratory class sessions are aimed at developing techniques and procedures described in theoretical and problem sessions. Laboratory practices are organized in 6 sessions of 2 hours each. As a preliminary to the practice of laboratory, students will perform a preliminary study. At the end of practice, students will solve a short questionnaire to assess the degree of understanding of the concepts studied.

5.4.Planning and scheduling

5.5.Bibliography and recomended resources