



## Course guides

# 230154 - EQSIP - Quality of Service Engineering in IP Networks

Last modified: 06/05/2019

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

**Degree:** BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Optional subject).  
BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Optional subject).  
BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).

**Academic year:** 2019    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

### LECTURER

**Coordinating lecturer:** MÓNICA AGUILAR IGARTUA

**Others:** MÓNICA AGUILAR IGARTUA

### PRIOR SKILLS

Basic knowledge of communications networking protocols.

### REQUIREMENTS

Basic knowledge of communications networking protocols.

### TEACHING METHODOLOGY

### LEARNING OBJECTIVES OF THE SUBJECT

The course includes basic engineering concepts for the provision of QoS (quality of service, QoS) in IP networks. We will work with analytical and simulation tools to conduct a performance evaluation of IP networks in various scenarios, with particular emphasis on infrastructureless wireless networks (ad hoc networks). Various objective and subjective QoS metrics will be studied and used to analyze the performance of multimedia services such as video on demand.

### STUDY LOAD

Type	Hours	Percentage
Hours large group	39,0	26.00
Hours small group	13,0	8.67
Self study	98,0	65.33

**Total learning time:** 150 h

## CONTENTS

### 1. Introduction

**Description:**

- Architectures to provide quality of service (QoS, Quality of Service) in the Internet. Integrated services and data flow. Differentiated services and classes of services.
- RSVP (Resource Reservation Protocol). TSPEC (Traffic Specification) to characterize the traffic. Example: Video on demand.
- Most important QoS parameters for each type of traffic (data, video, voice...).
- Most important QoS parameters for each type of traffic (data, voice, video).
- Objective and subjective QoS parameters for video-on-demand services.
- Main characteristics of the video-on-demand traffic.
- QoS-aware routing protocols for Mobile and Vehicular ad hoc networks (MANET and VANET).
- Laboratory practices with the simulators Scalev and NS2.

**Full-or-part-time:** 26h

Theory classes: 6h

Laboratory classes: 2h

Self study : 18h

### (ENG) 2. Algorithms to support the provision of QoS over the Internet

**Description:**

- Control de admisi3n de un nuevo flujo de paquetes.
- Algoritmos leaky bucket. Funci3n policia. Conformado del tráfico.
- Algoritmos de disciplina de servicio (scheduling). First-In-First-Out (FIFO), Round Robin (RR), Weighted Round Robin (WRR), Weighted Fair Queueing (WFQ).

**Full-or-part-time:** 27h

Theory classes: 7h

Laboratory classes: 2h

Self study : 18h

### (ENG) 3. Transmissi3n de video sota demanda a Internet

**Full-or-part-time:** 26h

Theory classes: 6h

Laboratory classes: 2h

Self study : 18h

### 4. QoS metrics for video on demand services over the Internet

**Description:**

- Objective QoS parameters: percentage of packet losses, average packet delay, jitter delay, Peak-Signal-to-Noise Ratio (PSNR).
- Subjective QoS parameters: Quality of Experience (QoE), Mean Opinion Score (MOS).
- Measure of objective and subjective QoS parameters.

**Full-or-part-time:** 30h

Theory classes: 9h

Laboratory classes: 3h

Self study : 18h



### (ENG) 5. Transmission of video on demand over infrastructureless wireless networks (MANET, Mobile Adhoc Network)

**Description:**

- Main characteristics and applications of the MANETs.
- Multipath routing protocol based on DSR (Dynamic Source Routing) which uses various metrics to make the routing decisions. MMDSR (Multipath Multimetric Dynamic Source Routing).
- Performance evaluation of a video on demand service over MANETs using the NS2 simulator.

**Full-or-part-time:** 41h

Theory classes: 11h

Laboratory classes: 4h

Self study : 26h

## ACTIVITIES

### LABORATORY

**Description:**

Performance evaluation of IP networks using the NS-2 simulator.

**Full-or-part-time:** 14h

Theory classes: 14h

### (ENG) EXERCICIS

### (ENG) CONTROLS DE RESPOSTA CURTA

### (ENG) EXAMEN DE RESPOSTES LLARGUES

## GRADING SYSTEM

Final exam: 50%

Midle exam and controls: 20%

Laboratori practices: 30%

## BIBLIOGRAPHY

**Basic:**

- Braun, T. [et al.]. End-to-end quality of service over heterogeneous networks [on line]. Springer, 2008 [Consultation: 01/04/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1139677>. ISBN 9783540791201.

**Complementary:**

- Hardy, W.C. QoS : measurement and evaluation of telecommunications quality of service. Chichester: John Wiley & Sons, 2001. ISBN 9780471499572.

- Marchese, M. QoS over heterogeneous networks. Chichester ; Hoboken, NJ: John Wiley & Sons, 2007. ISBN 9780470017524.



## RESOURCES

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**Hyperlink:**

- <https://sertel.upc.edu/~maguilar/simulators.html>
- <http://sertel.upc.es/content/scalev-project>