230154 - EQSIP - Quality of Service Engineering in IP 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 AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING
(Syllabus 2015). (Teaching unit Optional)
ECTS credits: 6  Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: MÓNICA AGUILAR IGARTUA
Others: MÓNICA AGUILAR IGARTUA

Prior skills
Basic knowledge of communications networking protocols.

Requirements
Basic knowledge of communications networking protocols.

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

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>39h</th>
<th>26.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>13h</td>
<td>8.67%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>98h</td>
<td>65.33%</td>
</tr>
</tbody>
</table>
# Content

## 1. Introduction

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>26h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>6h</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Self study:</td>
<td>18h</td>
</tr>
</tbody>
</table>

**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.
- 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.

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

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>27h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>7h</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>0h</td>
</tr>
<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Self study:</td>
<td>18h</td>
</tr>
</tbody>
</table>

**Description:**
- Control de admisión de un nuevo flujo de paquetes.
- Algoritmos de disciplina de servicio (scheduling). First-In-First-Out (FIFO), Round Robin (RR), Weighted Round Robin (WRR), Weighted Fair Queueing (WFQ).

## 3. Transmissió de vídeo sota demanda a Internet

<table>
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</tr>
<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Self study:</td>
<td>18h</td>
</tr>
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</table>
4. QoS metrics for video on demand services over the Internet

**Learning time:** 30h
- Theory classes: 9h
- Practical classes: 0h
- Laboratory classes: 3h
- Self study: 18h

**Description:**
- Subjective QoS parameters: Quality of Experience (QoE), Mean Opinion Score (MOS).
- Measure of objective and subjective QoS parameters.

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

**Learning time:** 41h
- Theory classes: 11h
- Practical classes: 0h
- Laboratory classes: 4h
- Self study: 26h

**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.

### Planning of activities

<table>
<thead>
<tr>
<th>LABORATORY</th>
<th>Hours: 14h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 14h</td>
<td></td>
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</tbody>
</table>

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

(ENG) EXERCICIS

(ENG) CONTROLS DE RESPPOSTA CURTA

(ENG) EXAMEN DE RESPOSTES LLARGUES
Qualification system

Final exam: 50%
Midle exam and controls: 20%
Laboratori practices: 30%

Bibliography

Basic:

Complementary:

Others resources:

Hyperlink
https://sertel.upc.edu/~maguilar/simulators.html

http://sertel.upc.es/content/scalev-project