The goal of this course is to teach the most relevant aspects concerning routing protocols, transport and control in telecommunications networks, in particular, in the Internet. Based on the knowledge about static routing acquired in previous courses, we will present the different algorithms and dynamic routing protocols, both unicast and multicast. In addition, we will discuss certain protocols necessary for the Internet operation and some typical applications such as WWW.
Learning outcomes:

- It has capacity to build, operate and manage networks, services, processes and telecommunications applications from the point of view of telematic services.
- Is able to apply the techniques of switching and routing in fixed and mobile environments.
- Understands and applies the most appropriate protocols to transport information correctly and keep the sessions during transmission.
- Use the tools necessary to easily build, operate and manage ICT services, especially those related to the Internet, web and multimedia.
- Be familiar with the protocols and communication interfaces at different levels of the network architecture and be able to describe them, program them, validate them and optimize them.
- Know the technological progress of transmission, switching and the process to improve networks and online services.
- Design and implement a good strategy for searching specialized information. Identify the relevance and quality of this information.
- Perform tasks based on the guidelines set by the teacher, taking the time and the resources necessary. Assesses own strengths and weaknesses and act accordingly.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 39h</th>
<th>26.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group: 26h</td>
<td>17.33%</td>
</tr>
<tr>
<td></td>
<td>Self study: 85h</td>
<td>56.67%</td>
</tr>
</tbody>
</table>
# Content

| Chapter 1. Switching review | **Learning time:** 10h  
Theory classes: 3h  
Laboratory classes: 2h  
Self study: 5h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Basic switching concepts review. Switches, spanning tree and VLANs with Linux.</td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong> Laboratory practice. Evaluation of the practice.</td>
<td></td>
</tr>
</tbody>
</table>

| Tema 2. IP Review | **Learning time:** 10h  
Theory classes: 3h  
Laboratory classes: 2h  
Self study: 5h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> IP basics review and static routing.</td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong> Laboratory practice. Evaluation of the practice.</td>
<td></td>
</tr>
</tbody>
</table>

| Chapter 3. Network Applications | **Learning time:** 10h  
Theory classes: 3h  
Practical classes: 2h  
Self study: 5h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Network applications and their relationship to the operating system. File descriptors and client server architecture. Use of the netcat tool.</td>
<td></td>
</tr>
<tr>
<td><strong>Related activities:</strong> Laboratory practice. Evaluation of the practice.</td>
<td></td>
</tr>
</tbody>
</table>
# Chapter 4. DNS

**Learning time:** 10h  
- Theory classes: 3h  
- Laboratory classes: 2h  
- Self study: 5h

**Description:**  
Explanation of the name to IP translation system.

**Related activities:**  
Laboratory practice. Evaluation of the practice.

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# Chapter 5. DHCP and WWW

**Learning time:** 10h  
- Theory classes: 3h  
- Laboratory classes: 2h  
- Self study: 5h

**Description:**  
Dynamic address assignment (DHCP). WWW including basic HTML and HTTP.

**Related activities:**  
Laboratory practice. Evaluation of the practice.

---

# Chapter 6. Firewalls and address translation

**Learning time:** 10h  
- Theory classes: 3h  
- Laboratory classes: 2h  
- Self study: 5h

**Description:**  
Firewall rules with iptables and dynamic address translation (NAT).

**Related activities:**  
Laboratory practice. Evaluation of the practice.

---

# Chapter 7. Tunnels

**Learning time:** 9h  
- Theory classes: 1h 30m  
- Laboratory classes: 3h  
- Self study: 4h 30m

**Description:**  
Description of networking technologies for tunnels.

**Related activities:**  
Laboratory practice. Evaluation of the practice.
## Chapter 8. Multicast

**Description:**
Description of multicast technologies.

**Related activities:**
Laboratory practice. Evaluation of the practice.

**Learning time:** 10h
- Theory classes: 2h
- Laboratory classes: 3h
- Self study: 5h

## Chapter 9. Unicast dynamic routing

**Description:**
Algorithms of shortest path Bellman-Ford and Dijkstra. Protocols RIP, OSPF, BGP and MPLS.

**Related activities:**
Laboratory practice. Evaluation of the practice.

**Learning time:** 36h
- Theory classes: 12h
- Laboratory classes: 6h
- Self study: 18h

## Chapter 10. Introduction to IPv6

**Description:**
Introduction to IPv6

**Learning time:** 12h
- Theory classes: 6h
- Self study: 6h
Planning of activities

<table>
<thead>
<tr>
<th>Laboratori exam with short answers</th>
<th>Hours: 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: Partial exam of laboratory</td>
<td>Laboratory classes: 1h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Final exam</th>
<th>Hours: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: Final exam</td>
<td>Theory classes: 2h</td>
</tr>
</tbody>
</table>

Qualification system

5 Test assessments: 14% x 5 = 70%
Laboratory control: 30%

Bibliography

Basic: