

<b>Program</b>	<b>09TT- Engineering in Telecommunication Technologies and Services</b>
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<b>Course number and name</b>	
<b>Number</b>	95000023
<b>Name</b>	Telecommunication Networks and Services Redes y Servicios de Telecomunicación
<b>Semester</b>	Y2-S4

<b>Credits and contact hours</b>	
<b>ECTS Credits</b>	6
<b>Contact hours</b>	63

<b>Coordinator's name</b>	León Vidaller Sisó
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<b>Specific course information</b>
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**Description of course content**

This course exposes the basic principles and architecture of telecommunication networks: protocol stacks, network functions, switching, and internetworking, with focus on network layer problems, such as routing.

This course also features a presentation of basic teletraffic theory, which is used as a tool for quantitatively analysing communication networks.

An introduction to network services and their characteristics is provided as the basis for describing Quality of Service (QoS) and network service agreements (Service Level Agreement and Service Level Specification).

**List of topics to be covered**

1. Network architecture:
  - a. Fundamentals. Network topology. Network architecture. Performance.
  - b. Network access. Access network technologies.
  - c. Switching in data networks. Spanning Tree Protocol.
  - d. Routing. Dijkstra's algorithm. Distance vector routing. Link state routing.
2. Teletraffic theory:
  - a. Introduction to queuing theory. The Poisson process and the exponential distribution. Comparison with real traffic. The M/M/1 system.
  - b. The M/G/1 system. Jackson networks.
  - c. Birth and death processes. M/M/1N, M/M/N/N and M/M/N systems.
3. Standardization and characterization of services.
  - a. Classification of services. Quality of service (QoS). Basic algorithms: leaky bucket and token bucket.
  - b. Case study: QoS specification in MetroEthernet.
4. Laboratories:
  - a. Ethernet access with VLAN.
  - b. Quality of Service in Ethernet networks.

<b>Prerequisites or co-requisites</b>		
None, but it will be assumed that students have some basic knowledge about packet switching, protocol stacks and probability theory.		
<b>Course category in the program</b>		
<input checked="" type="checkbox"/> R (required)	<input type="checkbox"/> E (elective)	<input type="checkbox"/> SE (selective elective)

<b>Specific goals for the course</b>	
<b>Specific outcomes of instruction</b>	
<p>RA46: knowledge of functional and structural components of a telecommunication network and the fixed and mobile services provided by the network.</p> <p>RA47: understanding of switching and network resource sharing technologies.</p> <p>RA48: ability to study and analyse the performance of a telecommunication network (delay, loss probability, blocking probability, etc.).</p> <p>RA49: knowledge of protocol architecture models</p> <p>RA50: understanding of the mechanisms of the TCP/IP protocol suite; understanding of routing and network interconnection methods.</p> <p>RA51: knowledge of standards and regulations of network protocols and architectures published by international standardization bodies (ITU-T, ETSI, IETF, IEEE 802, etc.)</p>	
<b>Student outcomes addressed by the course</b>	
CECT12, CECT13, CECT14, CECT15, CECT2, CECT3, CECT6, CG1, CG6, CG9.	

<b>Bibliography and supplemental materials</b>	
<ul style="list-style-type: none"> <li>• Larry L. Peterson, Bruce S. Davie. <i>Computer Networks: A Systems Approach</i>. 5th edition. Morgan Kaufmann, March 2011.</li> <li>• Andrew. S. Tanenbaum. <i>Computer Networks</i>. 5th Ed. Prentice Hall. 2011.</li> <li>• Villy B. Iversen. <i>Teletraffic Engineering and Network Planning</i>, DTU Course 34340, <a href="http://www.fotonik.dtu.dk">http://www.fotonik.dtu.dk</a>, Technical University of Denmark, Revised May 20, 2010.</li> <li>• ETSI TS 185 001 V1.1.1 (2005-11), Technical Specification, <i>Telecommunication and Internet converged Services and Protocols for Advanced Networking (TISPAN), Next Generation Network (NGN), Quality of Service (QoS) Framework and Requirements</i></li> <li>• Ralph Sanitoro. <i>Metro Ethernet Services – A Technical Overview</i>. MetroEthernet Forum white paper, 2003.</li> <li>• Slides, exercises and laboratory assignments published on the course Moodle portal.</li> </ul>	

<b>Teaching methodology</b>			
<input checked="" type="checkbox"/> lectures	<input checked="" type="checkbox"/> problem solving sessions	<input checked="" type="checkbox"/> collaborative actions	<input checked="" type="checkbox"/> laboratory sessions
<b>Other:</b>			