

Program	59TL – Telematics Engineering B. Eng.
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Course code and name	
Code	595000230
Name	Advanced Networks and Services
Semester	S6 [(February-June)]

Credits and contact hours	
ECTS Credits	6
Contact hours	60

Coordinator's name	Parada Gélvez, Hugo Alexer [hugoalexer.parada@upm.es]
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Specific course information	
Tuition language	Spanish
Description of course content	
<p>The student workload in this course is equivalent to 162 hours, 65% approx. should correspond to self-learning activities.</p> <p>Thanks to this course the student will get a deeper, global and systemic vision of the most advanced networks, as well as the interworking of their networks and services.</p>	
List of topics to be covered	
<ol style="list-style-type: none"> 1. MPLS: Advanced applications of MPLS technology. <ol style="list-style-type: none"> 1.1. Introduction. MPLS applications. 1.2. Layer 3 MPLS Virtual Private Networks. 1.3. Layer 2 MPLS Virtual Private Networks. 2. Structure and services of packet-switched networks. <ol style="list-style-type: none"> 2.1. Structure of IP networks. 2.2. Services: access to Internet, Intranet and VPN. 2.3. Access types: ADSL, HFC, FTTH, Metro Ethernet (REM). 2.4. Wholesale services: national IP, NEBA. 3. SDN and NFV: Software Defined Networks and Network Function Virtualization <ol style="list-style-type: none"> 3.1. Introduction: components of modern networks. 3.2. SDN (Software Defined Networking) <ol style="list-style-type: none"> 3.2.1. SDN controllers. 3.2.2. Definitions, principles and architecture. 3.2.3. Network programming protocols: Southbound Interfaces (SBI) and Northbound Interfaces (NBI). 3.4. SD-WAN (Software Defined Wide Area Network) <ol style="list-style-type: none"> 3.4.1. SD-WAN architecture: overlay & underlay 3.4.2. Securitization of communications and distributed security. 4. IMS: IP Multimedia Subsystem. <ol style="list-style-type: none"> 4.1. Introduction to IMS: definition and scopes. 	

4.2. IMS architecture. 4.3. IMS interfaces and protocols. 4.4. Services in an IMS network. Lab sessions: 1. MPLS VPN: Layer 3 VPNs over an MPLS network. 6. VLAN: Setting up a Layer 2 switch network with VLANs. 7. SDN: Design and configuration of a SDN network and Openflow traffic analysis	
Prerequisites or co-requisites	
<ul style="list-style-type: none"> – Telecommunication Networks and Services – Computer Networks – Signaling and Switching 	
Course category in the program	
<input checked="" type="checkbox"/> R (required)	<input type="checkbox"/> E (elective) <i>(elective courses may not be offered every year)</i>

Specific goals for the course	
Specific outcomes of instruction	
<ul style="list-style-type: none"> • RA1029 – To apply the knowledge about the supply of MPLS advanced services to the configuration and administration of a network. • RA566 – To describe the mechanisms and protocols used to supply advanced services with MPLS. • RA1028 – To describe the IMS architecture and protocols to offer multimedia services with different access technologies (fixed and mobile) over IP networks. • RA1109 – To configure and manage a network composed by Layer 2 switches and that uses traffic segmentation through VLANs. • RA1150 – To apply the fundamentals of software-defined networks for controlling and configure the network devices and to analyze exchanged traffic to accomplish these tasks. • RA1199 – To describe and justify the structure, services, technologies and procedures of a packet switched network in business environments. • RA1193 – To describe and justify the fundamentals of software-defined networks, including its application to the field of WAN networks (SD-WAN), as well as network function virtualization. 	

Further reading and supplementary materials	
<ul style="list-style-type: none"> – International Telecommunication Union (Telecommunication Standardization Sector): http://www.itu.int/ITU-T/ – The Internet Engineering Task Force: http://www.ietf.org/ – European Telecommunications Standards Institute (ETSI): http://www.etsi.org/ – Broadband Forum: http://www.broadband-forum.org/ – http://www.tech-invite.com/index.html – Open Networking Foundation (ONF): https://www.opennetworking.org/ – Network Functions Virtualization (NFV) with a Touch of SDN. Rajendra Chayapathi. CCIE® No. 4991, Syed FarrukhHassan CCIE® No. 21617. PareshSha, Adyson-Wesley. – Luc De Ghein. MPLS Fundamentals. Cisco Press, 2017: 	

<https://learning.oreilly.com/videos/mpls-fundamentals/9780134675398>

- <https://www.sdxcentral.com/>
- Moodle.