Universida_{de}Vigo

IDENTIFYING DATA

Network Technologies

Subject	Network Technologies			
Code	V05M145V01104			
Study programme	Telecommunication Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Mandatory	1st	1st
Teaching language	Galician			
Department				
Coordinator	López Ardao, José Carlos			
Lecturers	López Ardao, José Carlos			
E-mail	jardao@det.uvigo.es			
Web	http://www.socialwire.es			
General description	This subject covers the competencies in the BOE for the Master degree to achieve those professional attributions of Telecommunications Engineer related to the underlying technologies in the Computer Networks. In any way, it is an advanced course within the scope of these technologies, continuing and intensifying the basic contents studied in the subjects of the GETT.			

Competencies

Code	
A5	CB5 Students must have learning skills to allow themselves to continue studying in largely self-directed or autonomous way
B1	CG1 Ability to project, calculate and design products, processes and facilities in telecommunication engineering areas.
B4	CG4 Capacity for mathematical modeling, calculation and simulation in technological centers and engineering companies, particularly in research, development and innovation tasks in all areas related to Telecommunication Engineering and associated multidisciplinary fields.
B8	CG8 Ability to apply acquired knowledge and to solve problems in new or unfamiliar environments within broader and multidiscipline contexts, being able to integrate knowledge.
B12	CG12 Skills for lifelong, self-directed and autonomous learning.
C4	CE4 Ability to design and plan networks for transporting, broadcasting and distribution of multimedia signals.
C6	CE6 Ability to model, design, implement, manage, operate, and maintain networks, services and contents.
C7	CE7 Capacity for planning, decision making and packaging of networks, services and applications, taking into account the quality of service, direct and operating costs, plan implementation, monitoring, safety procedures, scaling and maintenance, as well as managing and ensuring quality in the development process.
C12	CE12 Ability to use programmable logic devices, as well as to design advanced electronic systems, both analog and digital. The ability to design communications components such as routers, switches, hubs, transmitters and receivers in different bands.

Learning outcomes

Expected results from this subject	Training and Learning Results
Know how to model mathematically the essential elements of a network of telecommunications	A5 B1 B4 B8 B12 C4 C6 C7

Understand the fundamental results on the capacity for different types of networks	B1
	B4
	B8
	C4
	C6
	C7
Understand, formulate and solve simple models for analyzing the performance of a computer network	B1
	B4
	B8
	C4
	C6
	C7
	C12
Know how to plan, design and deploy switched networks and IP networks in any application environment	A5
	B1
	B4
	B8
	B12
	C4
	C6
	C7
Know and understand the internal architecture of the switching equipment, methods of resource allocation and the basic techniques of providing Quality of Service	A5
	B1
	B4
	B8
	B12
	C4
	C6
	C12

Contents

Topic	
1. Network modeling (I)	a) Links: Statistical Multiplexing and queues
	b) Analysis of delays and losses in queues
2. Network modeling (II)	a) Modeling of queues
	b) Networks of queues
3. Network modeling (III)	a) Flow Networks
	b) Resoure Allocation
	c) Switching Architectures
	d) Scheduling in switches
4. Design and planning of Ethernet networks (I)	a) Management and planning of VLANs.
	b) VLAN Trunking. QinQ
	c) VTP
5. Design and planning of Ethernet networks (II)	a) Advanced STP
	b) Link Aggregation
	c) Guidelines for network planning
6. Interdomain Routing in Internet (I)	a) Hierarchical Routing in Internet. Domains and ASes
	b) Algorithms for Interdomain Routing
	c) EIGRP
7. Interdomain Routing in Internet (II)	a) OSPF
8. Inter-AS Routing	a) BGP
9. Design and planning of IP networks	a) Access Lists, route maps and prefix lists
	b) Route Filtering
	c) Traffic Filtering
	d) NAT
	e) DHCP
10. Traffic Engineering and MPLS	a) Traffic Engineering
	b) Basic Concepts about MPLS
	c) Label Distribution: LDP
	d) MPLS-TE
11. Quality of service	a) Basic Concepts of QoS
	b) Traffic Classification and marking
	c) Traffic Shaping and Policing
	d) Active Queue Management (AQM)
	e) Bandwidth Scheduling
	f) DiffServ Architecture

12. Multimedia and Internet	a) Multimedia Applications: Types (VoIP, IPTV vs OTT, VoD, etc.) and requirements b) Impact of the delay and losses in multimedia applications c) Systems of Streaming Multimedia: UDP/RTP and HTTP d) Multicast. IGMP e) Access Networks for IPTV

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practises	9	13.5	22.5
Autonomous troubleshooting and / or exercises	0	17.5	17.5
Master Session	27	54	81
Long answer tests and development	2	0	2
Long answer tests and development	2	0	2

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Laboratory practises	Practices of design, planning and architecture in different network scenarios and with different protocols, using GNS3 emulator. This methodology is related to the competencies CG1, CG4, CG8, CE4, CE6, CE7, CE12
Autonomous troubleshooting and / or exercises	This activities will entail the development of autonomous exercises, tasks, tests, etc. by the student. With this methodology will work the competitions CB5, CG1, CG4, CG8, CG12, CE4, CE6, CE7, CE12
Master Session	Exposition of the ideas, concepts, technical and algorithms belonging to the lessons of the course. This also includes the resolution of problems and theoretical questions in the classroom, and two sessions of an hour for midterm exams, and a session of two hours for the final exam. With this methodology will work the competitions CG1, CG4, CG8, CE4, CE6, CE7, CE12

Personalized attention

Methodologies	Description
Master Session	Individually personalized attention and attendance will be dispensed. The tutorial schedule will be announced at the beginning of the course. No appointment is necessary.
Laboratory practises	Individually personalized attention and attendance will be dispensed. The tutorial schedule will be announced at the beginning of the course. No appointment is necessary.

Assessment

	Description	Qualification	Training and Learning Results		
Autonomous troubleshooting and / or exercises	Along the term, exercises, questions and tests must be done in the virtual classroom by all the students in an autonomous way. These tasks have a global weight of 10%	10	A5	B1 B4 B8 B12	C4 C6 C7 C12
Long answer tests and development	Two exams will be done. The first one will cover lessons 1 to 5 and the second one lessons 6 to 9. Each partial exam has a 20% weight.	40		B1 B4 B8	C4 C6 C7 C12
Long answer tests and development	Final exam covering all the lessons. It supposes a weight of 50% but a minimum qualification of 3.5 points on 10 is required	50		B1 B4 B8	C4 C6 C7 C12

Other comments on the Evaluation

The students can choose the evaluation method, continuous or single.

Continuous Evaluation (CE) will consist of:

- Two midterm exams (ME1 and ME2) in weeks 7 and 11, covering, respectively, the contents of the lessons 1 to 5, and 6 to 9. Each midterm exam has a 20% weight in the Final Qualification (FQ).

- Participation in the online activities (OA) in virtual environment, that represent 10% of the Final Qualification (FQ).

- A final exam (FE) covering all contents, with a weight of 50% of the Final Qualification (FQ). A minimum qualification of 3.5 points on 10 is required

FQ-CE = 0.2x(ME1 + ME2) + 0.1xOA + 0,5xFE if FE >= 3.5

FQ-CE = FE if FE< 3.5

Single evaluation (SE) will only consist of the same FE at the end of the term.

It is considered that a student chooses CE when presenting to any midterm exam, election to be held until end of course.

Students who do not present to any midterm exam, compulsorily opt for the Single Evaluation.

A new final exam (FE) will be done in the official dates in July, in order to improve the qualification with respect to May,

The qualifications for all exams, partial or final, and activities will affect only the actual academic year.

In case of detection of plagiarism in any of the works/test/exams, the final qualification will be Suspense (0) and this case will be communicated to the School Head.

Sources of information
Basic Bibliography
J.F. Kurose, K.W. Ross, **Computer networking: a top-down approach featuring the Internet**, 7ª,
Complementary Bibliography
R. Srikant & Lei Ying, **Communication Networks**, Cambridge University Press,
Villy B. Iversen, **Teletraffic Engineering Handbook**, Web,
Villy B. Iversen, **Teletraffic Engineering and Network Planning**, Web,
Kun I. Park, **QoS in packet networks**, 1ª,
Pazos Arias, J.J., Suárez González, A., Díaz Redondo, R.P., **Teoría de colas y simulación de eventos discretos**,
M.J. Newman, **Networks**, Oxford Univ. Press,
Diane Teare, **Implementing Cisco IP Routing (ROUTE) Foundation Learning Guide**, Cisco Press,
Richard Froom, Balaji Sivasubramanian, Erum Frahim, **Implementing Cisco IP Switched Networks (SWITCH) Foundation Learning Guide**, Cisco Press,

Recommendations
Subjects that continue the syllabus
Network Information Theory/V05M145V01327

Subjects that it is recommended to have taken before
(*)Redes de Ordenadores/V05M145V01403