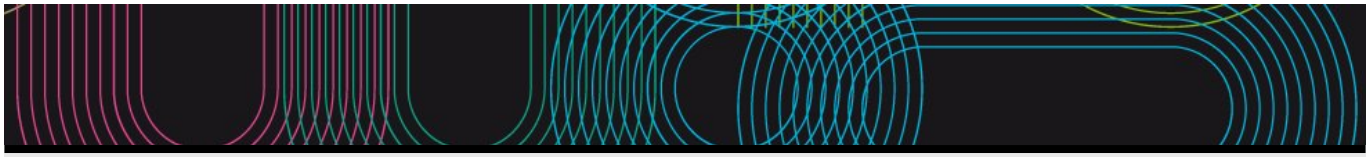

IDENTIFYING DATA				
Data Networks: Technology and Architecture				
Subject	Data Networks: Technology and Architecture			
Code	V05G301V01304			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Rodríguez Pérez, Miguel			
Lecturers	Rodríguez Pérez, Miguel Rodríguez Rubio, Raúl Fernando			
E-mail	miguel@det.uvigo.gal			
Web	http://faitic.uvigo.es			
General description	The objective of this subject is to teach our students the technical basics that govern the modern computer networks, regarding topics like new switching paradigms, new access technologies or data transport with quality of service. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Competencies	
Code	
B1	CG1: The ability to write, develop and sign projects in the field of Telecommunication Engineering, according to the knowledge acquired as considered in section 5 of this Law, the conception and development or operation of networks, services and applications of Telecommunication and Electronics.
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
C30	CE30/TEL4 The ability to describe, program, assess and optimize communication protocols and interfaces at different network architecture layers .
C32	CE32/TEL6 The ability to design networks and service architectures.
D2	CT2 Understanding Engineering within a framework of sustainable development.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Capacity to apply concepts and recent technologies of transmission, switching and data transport for the design, the operation and the exploitation of heterogeneous networks	B1 B4	C32	
Identify and know how to use specific solutions of switching, data transport and management for the deployment of special purpose networks.	B4 B6	C30	D2
Know and apply the techniques and the mechanisms of engineering of data traffic in packet networks, both in close and open environments.	B4	C30	
Practical capacity for the design, usage and configuration of advances computer networks, from the point of view of switching, quality of service, data transport and telematic services deployment.		C30 C32	D2

Contents	
Topic	
LAN Virtualization Technologies	The VLAN Concept Trunks Routing Considerations
Network virtualization	Tunnels Overlay networks Remote access (VPNs)
Advanced switching mechanisms	Label switching (MPLS) MPLS applications VPNs with provider support
IP mobility	Network mobility concepts IPv4 Mobility IPv6 Mobility
Access network technologies	xDSL Cable (HFC, DOCSIS) Optical access networks
Optical switching and transmission	Circuit switching, burst switching and packet swithching

Planning	Class hours	Hours outside the classroom	Total hours
Lecturing	21	24	45
Laboratory practical	8	12	20
Mentored work	7	42	49
Presentation	2	4	6
Report of practices, practicum and external practices	0	10	10
Essay questions exam	4	16	20

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

Methodologies	Description
Lecturing	The master lectures follow the usual scheme for this way of teaching; although, in some sessions, we will be able to dedicate 5 or 10 minutes of the class to make a simple examination (some brief questions) that will form part of the continuous evaluation. These short tests intend to motivate our students for a daily work.We work on competencies CG6, CE32 and CE32 in these master sessions.
Laboratory practical	In the labs the students will face several practical sessions -supervised by the professors- where they will settle the concepts learned in the theoretical classes. In such practicals they will use real network equipment (routers and switches) and/or virtualization software that will allow their instruction and training on their own. The practicals that the teachers will pose will be designed to be done within the respective face-to-face sessions at the School; although the student will be able to reproduce them at home using free software that will allow to virtualize the network hardware used in the laboratory. Also, the professors will be able to propose optional exercises that the student will be able to do as homework; and review individually in tutorial time. The students should acquire competencies CE30 and CE32 in the lab.
Mentored work	A project with a fairly large magnitude will be posed to be developed as a teamwork during all the semester. This practical work might require in its earliest stage to be set in context doing an additional theoretical study/research. Both works will be supervised by the professors with periodic meetings every 10/15 days (roughly). The tutored works are related with competencies CG1, CG4, CE30 and CE32.
Presentation	Every group must deliver the right documents where the suggested challenge (project teamwork) have to be explained in a detailed way. Also, the students must prepare a public presentation of the team solution to be defended in front of the rest of the class.The students practice competencie CG4 in the presentations.

Personalized assistance	
Methodologies	**Description**
Lecturing	During tuitition time, the professors will be able to help the students either individually in the understanding of the theoretical concepts explained in the master sessions and/or in the demonstrative lab activities, or to correct whichever optional homework done out of the class or collectively with the supervision of the teamwork that will share among a group of peers.
Laboratory practical	During tuitition time, the professors will be able to help the students either individually in the understanding of the theoretical concepts explained in the master sessions and/or in the demonstrative lab activities, or to correct whichever optional homework done out of the class or collectively with the supervision of the teamwork that will share among a group of peers.

Mentored work	During tuition time, the professors will be able to help the students either individually in the understanding of the theoretical concepts explained in the master sessions and/or in the demonstrative lab activities, or to correct whichever optional homework done out of the class or collectively with the supervision of the teamwork that will share among a group of peers.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	They will be marked as "passed" or "not passed". To pass them, the student must attend all the sessions of this type. If any unexpected event makes one student to miss one session, it can be recovered by doing an extra practical to be assigned by the teacher.	0	
Mentored work	The practical teamwork (project) that the student will face will determine one of the mid-term marks, T, of our continuous evaluation. The quantitative value (between 0-10) will be determined by the correctness of the solution presented by the group, the associated presentation and docs, the individual implication of the student in the developed work and the answers given to a individual interview with each member of the group.	50	B1 B4 B6 C32
Essay questions exam	There will be two written exams: a mid-term exam in the middle of the semester (Ep), and a final one (Ef). Both tests are theory examinations and will be evaluated individually between 0 and 10. Students must score at least 3 out of 10 to pass the subject.	50	C30 C32

Other comments on the Evaluation

Please note that even though utmost care has been placed to ensure the accuracy of this translation, it is possible that some mistakes have been inadvertently made. So, in case of discrepancy between this text and the canonical version available in the Galician language, the latter shall hold.

The assessment of the subject can either be based on a *continuous assessment* or *exam-only* assessment. Students will choose the *continuous assessment* if they take the mid-term written exam (Ep) around the middle of the semester. The percentages shown in the previous section only reflect the maximum weights that any activity (partial mark) can obtain when following the continuous evaluation strategy, and serve only as illustration. The precise assessment follows:

For *continuous assessment*, the final grade is the geometric mean between the tutored work grade (T) and the corresponding from the written tests (Y). Mark Y is calculated as the arithmetic mean between the final exam (Ef) and partial exam (Ep) marks. In order to pass the subject, students must obtain at least 3 out of 10 in value Ef and attend all sessions of laboratory practices (unless justified reasons). If this is not accomplished, the final grade is the minimum between Ef and 3.

Y = ½×(Ef+Ep)

FINAL MARK=(T×Y)^½

Students that do not opt for the continuous assessment, must take a final examination that will be made up of three parts: a theory examination, like the final one in the continuous assessment (Ef), an aptitude test about the laboratory, and a practical project that must be developed individually (T). The final mark, in this case, will be the geometric mean between the theoretical exam and the project work, provided that the student passes the aptitude test in the lab. If the Ef mark is less than 3 or the aptitude test is not passed, the final mark is calculated as the minimum between Ef and 3.

Finally, the end-of-program call and the second call evaluation (June/July) will have the same characteristics than the exam-only assessment just described, but students will be allowed to inherit the partial mark of any activity (T or Ef) if that has been passed during the same academic year, independently of the assessment modality that the student had followed.

Sources of information

Basic Bibliography

Peterson & Davis, **Computer Networks**, 5ª, Morgan Kauffman, 2011

Ina Minei & Julian Lucek, **MPLS-Enabled Applications**, 3ª, Wiley, 2011

Christian Huitema, **IPv6**, 2ª, Prentice Hall, 1997

Sanjeev Mervana, Chriis Le, **Design and implementation of DSL-based access solutions**, Cisco-press, 2001

Gerd Keiser, **FTTx Concepts and applications**, John Wiley & sons, 2006

Complementary Bibliography

Kurose & Ross, **Computer Networks**, 7ª, Prentice Hall, 2016
Charlie Scott, Paul Wolfe & Mike Erwin, **Virtual Private Networks**, 2ª, O'Reilly, 1998
Roderick W. Smith, **Broadband Internet connections: a user guide to DSL and cable**, Addison Wesley, 2007
Walter Goralski, **Tecnologías ADSL y xDSL**, McGraw-Hill, 2000
Biswanath Mukherjee, **Optical WDM networks**, Springer, 2006
G. Papadimitriou, C. Papazoglou & A. Pomportsis, **Optical Switching**, Wiley, 2008
James Farmer, Brian Lane, Kevin Bourg, Weyl Wang, **FTTx Networks: Technology implementation and operation**, 1ª, Morgan Kaufmann Publishers, 2016

Recommendations

Subjects that are recommended to be taken simultaneously

Network Security/V05G300V01543
Network and Switching Theory/V05G300V01642

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

It is not expected that it will be necessary to make any changes in the teaching planning of the subject. All planned tasks can be carried out remotely with the equipment that students typically have.