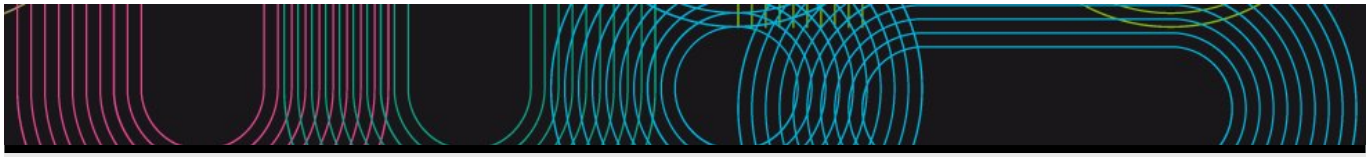

IDENTIFYING DATA				
Data Networks: Technology and Architecture				
Subject	Data Networks: Technology and Architecture			
Code	V05G300V01542			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Rodríguez Pérez, Miguel			
Lecturers	Rodríguez Pérez, Miguel Rodríguez Rubio, Raúl Fernando			
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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.			

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
New			
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

Network virtualization	Tunnels Overlay networks Remote access (VPNs) Addressing and localization
IPv6	Introduction Self-configuration Addressing scopes Transition mechanisms
Advanced switching mechanisms	Label switching (MPLS) MPLS applications VPNs with provider support
Access network technologies	xDSL Cable (HFC, DOCSIS) Optical access networks
Optical switching and transmission	SDH/SONET. Circuit switching, burst switching and packet swithching

Planning			
	Class hours	Hours outside the classroom	Total hours
Master Session	20	25	45
Laboratory practises	8	12	20
Tutored works	7	42	49
Presentations / exhibitions	2	4	6
Long answer tests and development	4	15	19
Short answer tests	1	0	1
Reports / memories of practice	0	10	10
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Master Session	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 impart the competencies CG6, CE32 and CE32 in these master sessions.
Laboratory practises	In the labs the students will face several practical sessions -supervised by the professors- where they will settle the concepts learnt in the theoretical classes. In such practices they will use real network equipment (routers and switches) and/or virtualization software that will allow their instruction and training on their own. The practices that the teachers will pose will be designed to be done within the respective face-to-face sessions at the School; although the student that like this need 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 adquire comnpetencies CE30 and CE32 in the lab.
Tutored works	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). And finally, they will select some of the best works for their public exhibition before the other groups of the course. The tutored works are related with competencies CG1, CG4, CE30 and CE32.
Presentations / exhibitions	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 attention	
Methodologies	**Description**
Master Session	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 practises	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.
Tutored works	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.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practises	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, he must replace it doing an extra practice that the professor will pose dynamically.	0	
Tutored works	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
Long answer tests and development	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 3/10 to pass the subject.	37.5	C30 C32
Short answer tests	With some periodicity, and within the master sessions, the professors will be able to incorporate brief tests (short response questionnaries), Es. These brief tests, together with the mid-term examination (Ep), compose the complementary part of the theory to the final examination Ef.	12.5	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 follow either be based on a *continuous evaluation* or on a single *final examination*. Students will choose the *continuous evaluation* if they take the mid-term written exam (Ep) at 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 work protected note (T) and the corresponding set of tests to answer (Y) rating. Mark Y is calculated as the arithmetic mean between the final exam (Ef) and for the rest of response tests conducted throughout the course (Ec); where Ec is obtained as the arithmetic mean of the partial exam (Ep) and the average short answer test scores(Es). 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 mediate justified reasons). If this is not accomplished, the final grade is the minimum between Ef and 3.

Ec=½Ep + ½ average(Es)

Y = ½×(Ef+Ec)

FINAL MARK=(T×Y)^½

Students that do not opt for the continuous evaluation, must take a final examination that will be made up of three parts: a theory examination, like the final one in the continuous evaluation (Ef), an aptitude test in 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 pass the aptitude test in the lab. If the Ef mark is less than 3 or the aptitudes test is not passed, the final mark is calculated as the minimum between Ef and 3.

Finally, the extraordinary examination session in July will have the same characteristics than the special final examination 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

Recommendations

Subjects that are recommended to be taken simultaneously

Network Security/V05G300V01543

Network and Switching Theory/V05G300V01642

Subjects that it is recommended to have taken before

Computer Networks/V05G300V01403