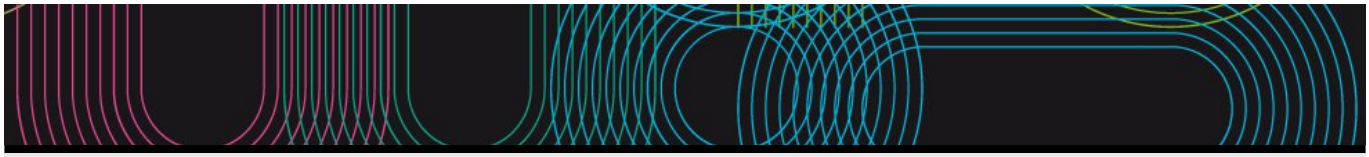

IDENTIFYING DATA

Data Networks: Technology and Architecture

Subject	Data Networks: Technology and Architecture			
Code	V05G301V01304			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
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://moovi.uvigo.gal/			
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.			

Training and Learning Results

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.

Expected results from this subject

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 Practical about VLAN configuration
Network virtualization	Tunnels Overlay networks Remote access (VPNs) Practical about tunneling
Advanced switching mechanisms	Label switching (MPLS) MPLS applications VPNs with provider support Practical about MPLS
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 switching Transmission on optimal medium

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	21	32	53
Laboratory practical	9	18	27
Mentored work	7	42	49
Presentation	1	0	1
Essay questions exam	2	8	10
Essay questions exam	2	8	10

*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. 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 teachers where they will settle the concepts learned in the theoretical classes. In such practicals they will use actual 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. Software to be used: GNS3, netcat, and SSH client and server. It is recommended to use a Linux distribution running on top of the bare hardware. Also, the teachers may 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, CE32 and CT2.
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 competence CG4 in the presentations.

Personalized assistance

Methodologies	Description

Lecturing	During the tutorial hours the teachers will give personalized attention either individually - to strengthen or guide the student in the understanding of the theoretical concepts explained in the lectures or in the practical demonstration sessions; and to correct or refocus the small optional practical work derived from these laboratory classes - or in a group setting with the follow-up of the work associated with the project of a considerable extent to be undertaken with fellow students. In these group tutorships - which have an attendance component (more or less one hour every fortnight), the solutions proposed by the group members will be discussed and their equal involvement in the final development will be verified and stimulated. Students can ask for tutoring sessions following the instructions provided in the profiles pages of the teachers of this subject: * Miguel Rodríguez Pérez: https://moovi.uvigo.gal/user/profile.php?id=11314 * Raúl F. Rodríguez Rubio: https://moovi.uvigo.gal/user/view.php?id=11315
Laboratory practical	During the tutorial hours the teachers will give personalized attention either individually - to strengthen or guide the student in the understanding of the theoretical concepts explained in the lectures or in the practical demonstration sessions; and to correct or refocus the small optional practical work derived from these laboratory classes - or in a group setting with the follow-up of the work associated with the project of a considerable extent to be undertaken with fellow students. In these group tutorships - which have an attendance component (more or less one hour every fortnight), the solutions proposed by the group members will be discussed and their equal involvement in the final development will be verified and stimulated. Students can ask for tutoring sessions following the instructions provided in the profiles pages of the teachers of the practical part of this subject: * Miguel Rodríguez Pérez: https://moovi.uvigo.gal/user/profile.php?id=11314
Mentored work	During the tutorial hours the teachers will give personalized attention either individually - to strengthen or guide the student in the understanding of the theoretical concepts explained in the lectures or in the practical demonstration sessions; and to correct or refocus the small optional practical work derived from these laboratory classes - or in a group setting with the follow-up of the work associated with the project of a considerable extent to be undertaken with fellow students. In these group tutorships - which have an attendance component (more or less one hour every fortnight), the solutions proposed by the group members will be discussed and their equal involvement in the final development will be verified and stimulated. Students can ask for tutoring sessions following the instructions provided in the profiles pages of the teachers of this subject: * Miguel Rodríguez Pérez: https://moovi.uvigo.gal/user/profile.php?id=11314 * Raúl F. Rodríguez Rubio: https://moovi.uvigo.gal/user/view.php?id=11315

Assessment

	Description	Qualification	Training and Learning Results
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 an individual interview with each member of the group.	40	B1 C32 D2 B4 B6
Essay questions exam	Partial exam (Ef). A written test of theoretical nature about the first four lessos of the subject. It will be evaluated individually between 0 and 10 points.	30	C30 C32
Essay questions exam	Final exam (Ef). A written test of theoretical nature. It will be evaluated individually between 0 and 10 points.	30	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 global assessment. Students will choose the *continuous assessment* if they take the midterm written exam (Ep) around the middle of the semester□never before the first month ends□. 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 actual assessment procedure follows:

For *continuous assessment*, the *final mark* is the weighted 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.

$Y = ½ \times (Ef+Ep)$

FINAL MARK=T^0.4×Y^0.6

Students that opt for the global assessment, must take a final examination that will be made up of two parts: a theory examination, like the final one in the continuous assessment (Ef) and a practical project that must be developed individually (T). The final mark, in this case, will be the weighted geometric mean between the theoretical exam and the project work.

Finally, both the extraordinary exam and the end-of-program call will have the same characteristics as 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.

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

The use of generative artificial intelligence (GAI) is permitted as a tool to complete the academic activities of this subject. Its use must be carried out in an ethical, critical and responsible manner. In the case of using GAI, any result it provides must be critically evaluated, and any citation or reference generated must be carefully verified. It is also recommended to declare the used tools.

Sources of information

Basic Bibliography

Peterson & Davis, **Computer Networks**, 6ª, Morgan Kauffman, 2021

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

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 Networking: A Top-Down Approach**, 8ª, Prentice Hall, 2021

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 it is recommended to have taken before

Computer Networks/V05G301V01210