

21753. Networking and service protocols (*Protocols de Xarxes i Serveis*)

1. Descriptive information on the subject

- **Subject's name:** Networking and service protocols (*Protocols de Xarxes i Serveis*)
- **Academic year:** 2012-13 **Year:** 2nd **Term:** 1st and 2nd
- **Type:** Compulsory **Module:** Networks

 Area: Networking Protocols and Communication Services
- **Degrees:** Bachelor's degree in Telematics Engineering and Bachelor's degree in Audiovisual Systems Engineering
- **Subject's code:** 21723
- **ECTS credits:** 8 **Time commitment:** 160-200 hours
- **Languages:** Catalan/Spanish, and most material in English
- **Teaching staff (language):** Miquel Oliver –MO- (Cat), Davinia Hernández-Leo –DHL- (Spanish), Manuel Palacín –MP- (Cat), Albert Domingo –AD- (Cat), Joan Melià –JM- (Cat), Luis Sanabria (Cast).

2. Presentation of the subject

The Networking and Service Protocols (acronym PXS, from *Protocols de Xarxes i Serveis*, code 21723) compulsory subject is a common subject of the Bachelor's degree in Telematics Engineering in UPF and it has 8 credits taught in the first and the second terms of the second academic year. It is a subject that deepens into the world of communication networks taking into account its architecture, protocols, services and organization.

The aim of this course is to introduce to students the basic principles of the operation of communication networks in general, taking as its main topic the example of the Internet with all its aspects. The approach being followed is top-down, that is started, after an introduction and history of communication networks, with the levels of application, explaining the operation of the more extended services in Internet such as web browsing, email, etc. and peer-to-peer download services. It is done a functional description of each service, putting emphasis on its architecture, protocols involved and their ways of operation. In this subject, a deep study is done until the transport layer, explaining the TCP / UDP protocols as reliable or non-reliable transmission mechanisms used in communications networks.

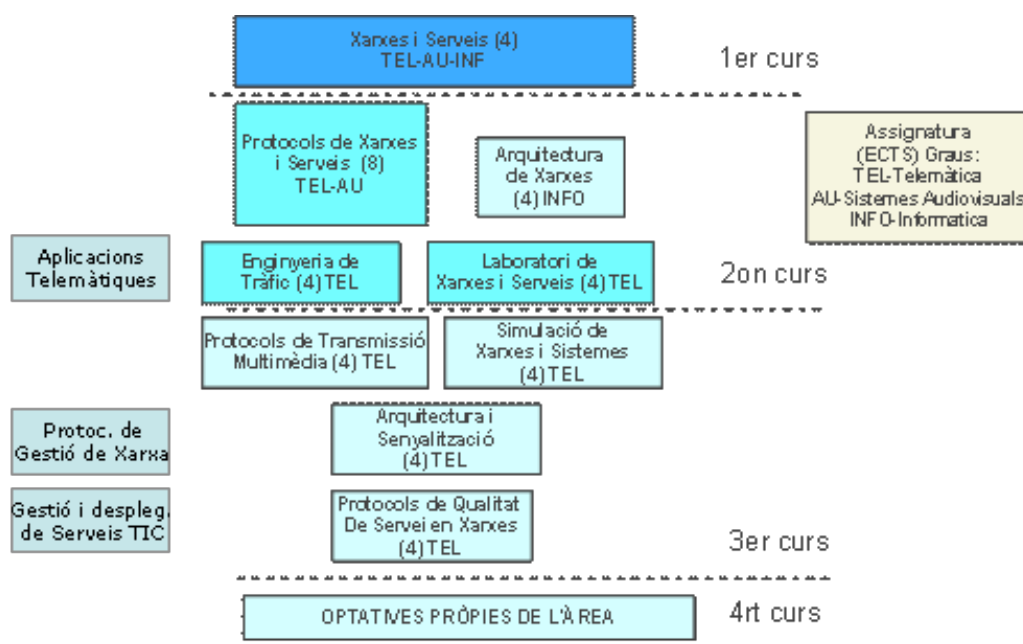
This subject is the result of the combination of lectures, where some topics can be discussed and students can actively participate, and laboratory sessions and seminars. These last sessions are useful to strengthen and expand the knowledge presented in the lectures. It is good to say that the material and the structure of the subject follows the book presented in the basic bibliography: Kurose-Ross, and much of the material used is taken from this source.

Previous requirements to follow the formative itinerary

To start the learning process in Network and Services Protocols, students must have completed and passed the subject Networks and Services of the previous year. It is a subject that includes expertise knowledge that are the basis for subsequent subjects that broaden and deepen the concepts and skills taught in this area of Communication Networks and Protocols.

It is important to say that this course requires specific knowledge of programming, a combination of those seen in Programming Fundamentals and in Object-Oriented Programming. Some of the concepts seen in Operating Systems will be specially useful, although this subject is taught only in the Bachelor's Degree in Telematics engineering, and also specially those concepts of competition facing the sockets programming.

This subject is the second of a basic itinerary in the area of Network Protocols and Communication Services, which takes place after Network and Services, and it follows a series of subjects such as: Network and Services Laboratory, Traffic Engineering in the second year, Multimedia Transmission Protocols, Simulation of Networks and Systems, Architecture and Signalling, and Service Quality Protocols in Networks in the third year, and a series of optional subjects. The figure below shows links between these subjects in the area, as well as their relationship and their teaching method in different degrees.



3. Competences to be acquired during the subject

Transferable skills	Specific competences
<i>Instrumental</i> INS1: Capacity to analyze and summarize INS3: Capacity to apply the knowledge into the analysis of situations and the problem resolution. INS6: Capacity to communicate orally and written in Catalan and Spanish (and English), in front of both expertise and non-expertise audiences. <i>Systemic</i> SIS1: Capacity to apply with flexibility and creativity the knowledge acquired and adapt them to new context and situations. SIS2. Capacity to progress in the knowledge and learning processes in a autonomous and continuous way.	<i>Specific in telecommunications field</i> T1 Capacity to learn in an autonomous way new knowledge and techniques appropriate to conception, development or exploitation of telecom services and systems. T6 Capacity to develop, create, organize and manage networks, systems, services and telecom infrastructures in specific residential, working and institutional contexts, taking the responsibility of its creation and continuous improvement, as well as knowing its economical and social impact. T13 Capacity to know, understand and use the network architecture, the protocol and the communication interfaces concepts. T14. Differentiate the concepts of access and transport networks, circuit commutation networks and packets, fixed and mobile networks, as well as the network systems and applications distributed. Voice, data and video services and interactive services.
<i>Specific competences of the Telematics subject</i> TE1. Capacity to build, use and manage the networks, services, processes and applications of telecommunications, understood as uptake, transport, representation, processing, storage, management multimedia information presentation systems, with a telematics services approach. TE5. Capacity to follow the technological progress of transmission, commutation, and the process to improve the telematics services and networks. TE6. Capacity to design client-server and P2P structures, operative systems and virtual machines.	

4. Contents

FIRST TERM:

Units

(Weeks-hours, teacher)

- Unit 1. Introduction to Communication Protocols (2w-4h, MO)
- Unit 2. Protocol architectures (1w-2h, MO)
- Unit 3. Application level protocols (3w-6h, MO)
- Unit 4. Transport level protocols (4w-8h, DHL)

Project

Design and implementation of a VoIP environment based on SIP split into four **practical sessions** (2h each, AD)

- P1. Ethereal and Client VoIP
- P2 and P3 Proxy SIP
- P4. Project Integration and trials

Seminars

(1,5h each, MO, DHL, MP, AD, LS)

- S1. New Internet Architecture trends (ACM article)
- S2. Web 2.0 Apps (Hispace article)
- S3. Introduction to transport level protocols
- S4. Problems and questions around transport services and UDP
- S5 and S6 Problems and questions around transport services and TCP

SECOND TERM:

Units

- Unit 5. Network level protocols (4w-8h, JM)
- Unit 6. Link level protocols (3w-6h, JM)
- Unit 7. The physical level (1w-2h, JM)

Project

Design and implementation of a corporate network with three sites and backup links –split into **practical sessions**- (2h each, MP)

- P5. Design in a IP/Cisco Tutorial level
- P6. Cisco equipment Tutorial
- P7. TCP/IP sockets programming
- P8. Integration and environment trials

Seminars

(1,5h each, JM, MP, AD, LS)

- S7. Network layer problems
- S8. Routing Problems
- S9. Link layer Problems
- S10. Problems and questions about LANs and Ethernet networks
- S12. Seminar's review

SCHEDULE FOR THE FIRST AND SECOND TERMS:

FIRST TERM	Tuesday 14.30-16.30	Wednesday 18.30-20.30	Thursday 16.30-18.30	SECOND TERM	Tuesday 14.30-16.30	Wednesday 18.30-20.30	Thursday 16.30-18.30
1 24-28 set	25/09 T1+T2, MO	26/09 T1+T2, MO	27/09 T1+T2, MO	1 07-11 gen	08/01 T1+T2, JM	09/01 S201 –MP- S202 –LS-	10/01 S101 –JM- S103 –AD-
2 1-5 oct	02/10 S101 –MO- S103 –AD-	03/10 P202 –AD-	04/10 P102 –AD- S201 –MP- S203 –LS-	2 14-18 gen	15/01 T1+T2, JM	16/01 P202 –MP- S101 –JM- S103 –AD-	17/01 P101 –MP- S201 –AD- S202 –LS-
3 08-12 oct	09/10 P101 –AD-	10/10 P201 –AD-	11/10 P202 –AD-	3 21-25 gen	22/01 P102 –MP-	23/01 P201 –MP-	24/01 P101 –MP-
4 15-19 oct	16/10 T1+T2, MO	17/10 P202 –AD-	18/10 T1+T2, MO	4 28 gen-1 feb	29/01 P202 –MP-	30/01 P102 –MP-	31/01 P201 –MP-
5 22-26 oct	23/10 P101 –AD- S201 –MP- S203 –LS-	24/10 P102 –AD-	25/10 P201 –AD- S101 –MO- S103 –MP-	5 4-8 feb	05/02 T1+T2, JM	06/02	07/02 T1+T2, JM
6 29 oct-2 nov	30/10 P101 –AD-	31/10 P201 –AD-	01/11 FESTIU	6 11-15 feb	12/02 P201 –MP-	13/02 P101 –MP-	14/02 P102 –MP-
7 5-09 nov	06/11 P102 –AD-	07/11 T1+T2, DHL	08/11 T1+T2, DHL	7 18-22 feb	19/02 P202 –MP-	20/02 P201 –MP-	21/02 P102 –MP-
8 12-16 nov	13/11 P201 –AD- S101 –DHL- S103 –MP-	14/11 P101 –AD-	15/11 P102 –AD- S201 –MP- S203 –LS-	8 25 feb-1 mar	26/02 T1+T2, JM	27/02 P202 –MP- S101 –JM- S103 –AD-	28/02 P101 –MP- S201 –AD- S202 –LS-
9 19-23 nov	20/11 P202 –AD- S201 –MP- S203 –LS-	21/11 T1+T2, DHL	22/11 S101 –DHL- S103 –AD-	9 4-8 mar	05/03 T1+T2, JM	06/03 S201 –MP- S202 –??-	07/03 S101 –JM- S103 –AD-
10 26-30 nov	27/11 S101 –DHL- S103 –AD-	28/11 T1+T2, DHL	29/11 S201 –MP- S203 –LS-	10 11-15 mar	12/03 T1+T2, JM	13/03 S201 –MP- S202 –LS-	14/03 S101 –JM- S103 –AD-
11 3 – 4 des	04/12 S201 –MP- S203 –LS-	05/12 S101 –DHL- S103 –AD-	NO LECTIU				

5. Evaluation depending on the competences achievement level

Students must get a minimum final mark of 5.0 points to pass the course. The final mark consists of two marks, one for each term, which can be averaged out only when both are greater than 4.0.

The mark of each term has three different punctuations: the mid-term test, the one based on a continuous evaluation of hand-ins made in seminar sessions, a mark based on the practical activities and the mark based on the final examination. So the final mark for the course will be calculated as follows:

	EVALUATION ITEMS	PES	SECOND TRY
Written assignments	 Written assignment term 1  Written assignment term 2		Yes (July)
Written outputs	 Control term 1  Control term 2		No
	 Seminar's homework		No
Laboratory output	 Lab practices		No
$N_{\text{subject}} = \text{Average}(N_{T1} ; N_{T2})$ only when $N_{Ti} > 4$ with $i = 1, 2$ $N_{Ti} = 0,5 * N_{\text{term exam } Ti} + 0,2 * N_{\text{mid-term } Ti} + 0,3 * N_{\text{seminars and lab activities } Ti}$ And $N_{\text{term exam } Ti} > 4$			

Evaluation of the subject

Seminars: these activities will be individually evaluated through a survey collected at the Aula Global. The mark is reported at the end of the survey and can be revised by the instructor.

Lab Practices: a final report, including all four lab sessions developments and discussions, will be done in groups at the end of each term. A previous survey will be done at the beginning of the lab session to incentive the pre-lab preparation.

To get a high mark in the resolution of the practical activities, it is recommended not to "cut and paste" indiscriminately, but to provide personal reflections on the data, especially evaluating those based on references provided by the students.

Term and mid-term evaluations: several individually written evaluations will be done along the course. In the middle of each term –week 5 or 6- there will be a mid-term evaluation that will consist of one or two problems plus a multi-response test. These evaluations will include all the material discussed in

theoretical classes, seminars and lab sessions. It will not be allowed to have textbooks or notes during the exam. The evaluation done at the end of the term will be planned during the evaluation weeks defined by the Secretary.

6. Bibliography and didactic resources

Basic bibliography

- Kurose, J. F., Ross, K. W, "Redes de Ordenadores, un enfoque descendente basado en Internet", 2da. Edición, Pearson-Addison Wesley, 2004.

Additional bibliography

- Tanenbaum, A., "Redes de Ordenadores", 4ta. edición, Pearson-Prentice Hall, 2003.
- Rincón, D., Casals, L., "Introducción a Internet", Edicions UPC, 2003.
- León-García A., Widjaja. I., "Redes de comunicación", McGraw Hill, 2002.

Learning material of the subject available in Aula Global

- Subject's notes.
- Subject's power points.
- Collection of subject solved problems.
- Collection of subject non-solved problems.

7. Methodology

The methodological approach of the subject called Networks and Services I is focused on designing a teaching-learning process based on two types of activities, divided into three clearly defined environments:

Activities/ Environment	Face-to-face (in the classroom)	Conducted (out of the classroom)	Autonomous (out of the classroom)
Lectures	Traditional class with teaching of theoretical contents on networks and services protocols.	Additional material search proposal in the blackboard sessions.	It is necessary to complete the proposal of each group, not taught in face-to-face sessions nor leaded in it.
Seminars	Components focused on learning specific objectives. Case/article discussions	Readings and resolution of problems before each session.	Extension of the readings and problem resolution
Practical Lab sessions	Laboratory work in groups of two people during the whole term.	Previous preparation of the activities that will be carried out in the laboratory session.	Elaboration of reports of each session and integration of the results at the end of the term.

Units	Time in the classroom (hours)	Time commitment
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	Lecture group (T)	Practical sessions group (P)	Seminar sessions group (S)	out of the classroom (estimated)	
B1	4	8	0	6	162 hours
B2	2		1,5	12	
B3	6		1,5	12	
B4	8		6	20	
B5	8	8	1,5	16	
B6	6		6	14	
B7	2		1,5	12	
TOTAL					