1. Descriptive information on the subject

- **Subject's name:** Networking and service protocols
- **Academic year:** 2011 - 2012 **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. It's also optional for Bachelor's degree in Computer Sciences (21460)
- **Subject's code:** 21723 i 21604
- **ECTS credits:** 8 **Time commitment:** 160-200 hours
- **Languages:** Catalan/Spanish/English, and some material in English
- **Teaching staff:** Miquel Oliver –MO- (Cat), Davinia Hernández-Leo –DHL- (Spanish), Manuel Palacín –MP- (Cat), Albert Domingo –AD- (Cat), Sougata Pal –SP- (English)

2. Presentation of the subject

The Networking and Service Protocols (acronym PXS, 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 deeps into the world of communication networks taking into account its architecture, protocols, services and organization. It has its natural continuation in the subject called Networks and Services, taught in the previous year.

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 and 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.

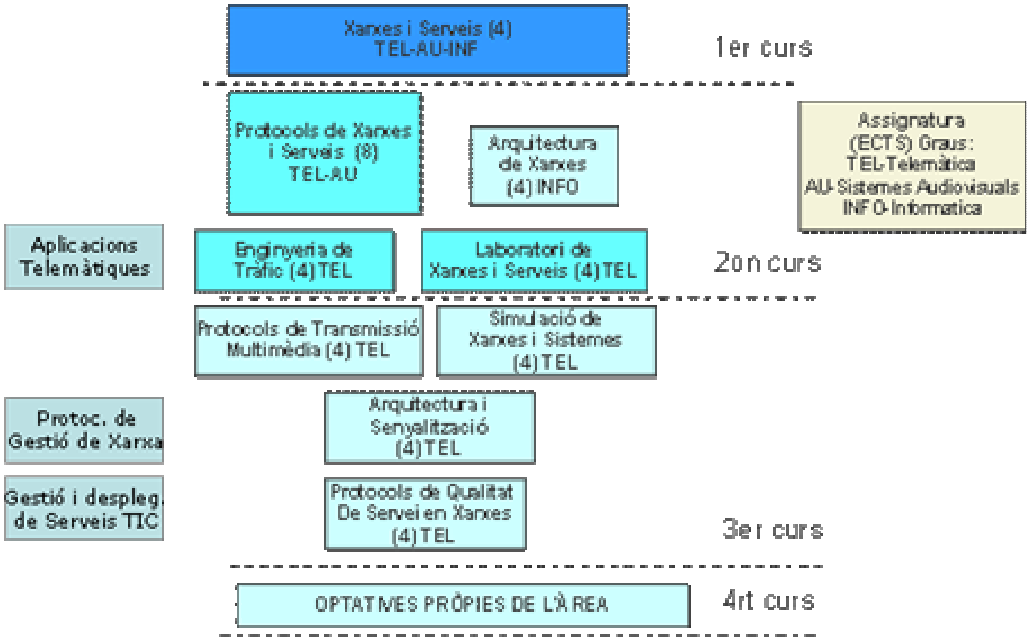
This subject is the result of the combination of lectures, where some topics can be discussed and students can actively participate, and laboratory sessions and seminars. These last sessions are useful to strengthen and expand the knowledge presented in the lectures. It is good to say that the material 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 obtained in the subject

<table>
<tr><th>Transferable skills</th><th>Specific competences</th></tr>
<tr><td>Instrumental

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, in front of both expertise and not expertise audiences.

Systemic

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 formation and learning processes in a autonomous and continuous way.</td><td>Specific in telecommunications area

T1 Capacity to learn in an autonomous way new knowledge and techniques appropriate to conception, development or exploitation of telecommunications services and systems.
T6 Capacity to develop, create, organize and manage networks, systems, services and telecommunications 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 concepts, the protocol concepts and the communication interfaces concepts.
T14. Differentiate the concepts of access and transport networks, circuit commutation networks and packets, fine and mobile networks, as well as the network systems and applications distributed. Voice, data and video services and interactive services.</td></tr>
<tr><td colspan="2">Specific competences of the Telematics area

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 customer-server and P2P structures, operative systems and virtual machines.</td></tr>
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4. Contents

(Weeks-hours, teacher)

FIRST TERM:

- 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)

Practical sessions: design and implementation of a VoIP environment based on SIP (4w)
(2h each, XN and AD)

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

Seminars (1,5h each, MO, DHL, XN, AD): from S1 to S6

S1. New Internet applications, current tendencies (mashups, etc.)
S2. Level of application -DNS-ENUM-
S3. Problems in a transport level
S4. Problems in a transport level
S5. Problems in a transport level
S6. Problems in a transport level

SECOND TERM:

- Unit 5. Network level protocols (4w-8h, JM)

- Unit 6. Link level protocols (3w-6h, JM)

- Unit 7. The physical level (1w-2h, JM)

Practical sessions: design and implementation of a corporative network with three sites and backup links (2h each, XN and AD):

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

Seminars (1,5h each, JM, XN, AD): from S7 to S12

S7. Network level problems
S8-9. IEEE 802.3 standard and variations
S10-11. IEEE 802.11 standard and variations
S12. Link level problems

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:

$$N_{subject} = Average(N_{T1}\ ;\ N_{T2})$$

$$\text{only when } N_{Ti} > 4 \quad \text{with } i = 1, 2$$

$$N_{Ti} = \max(N_{\text{final examination Ti}}\ ;\ 0{,}5 * N_{\text{final examination Ti}} + 0{,}2 * N_{\text{mid-term Ti}} + 0{,}3 * N_{\text{seminars and practical activities Ti}})$$

Evaluation of the subject

Seminars and practical activities:

The activities done during the seminar sessions randomly will be collected. The teacher will correct these activities and it will be part of the mark.
Each student is free to choose his/her couple of practical sessions of each term, but they can't change this couple during the whole term.
If at the time of the realization of the first practical activity a student hasn't got a partner, he/she has to say it to the teacher in order to proceed to create practical partners between the people in the same situation.
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.

Tests: they will include all material studied during the term until the last session. The days of the tests are in the planning of the course.

The tests consist of questions relating to theory and problems of the term. The content of the exam consists of all the material presented and explained and introduced in the lectures, seminars and laboratories. It won't be allowed to have textbooks or notes during the exam.
There will be a mid-term test, including the material studied until the last session during the same term, and a final term test that will include all the material (theory + practical sessions + seminars).

- ***Extraordinary sitting:*** it will consist of an examination in September. The maximum mark that can be got in this sitting is a (5.0) and it will consist of two parts, one corresponding to the contents of each of the terms. If one of the two parts has been passed, students only will have to do the exam of the term they didn't pass and they will have to pass it with a grade equal or greater than 5.0.

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.	Readings and resolution of problems after each session.	Extension of the readings and problem resolution
Practical 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 out of the classroom (estimated)	
	Lecture group (T)	Practical sessions group (P)	Seminar sessions group (S)		
B1	4	8	0	6	
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					**162 hours**