



Year : 2018/19

## **30350 - Data Transport Networks**

### **Syllabus Information**

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|--------------------------|---|
| <b>Academic Year:</b>    | 2018/19   |
| <b>Subject:</b>          | 30350 - Data Transport Networks   |
| <b>Faculty / School:</b> | 110 -   |
| <b>Degree:</b>           | 438 - Bachelor's Degree in Telecommunications Technology and Services Engineering |
| <b>ECTS:</b>             | 6.0   |
| <b>Year:</b>             | 3   |
| <b>Semester:</b>         | First semester  |
| <b>Subject Type:</b>     | Compulsory  |
| <b>Module:</b>           | ---   |

### **General information**

#### **Aims of the course**

#### **Context and importance of this course in the degree**

#### **Recommendations to take this course**

#### **Learning goals**

#### **Competences**

#### **Learning goals**

#### **Importance of learning goals**

#### **Assessment (1st and 2nd call)**

#### **Assessment tasks (description of tasks, marking system and assessment criteria)**

#### **Methodology, learning tasks, syllabus and resources**

#### **Methodological overview**

The learning process for this subject is as follows:

The subject is presented with a strong practical approach and using Problems-based Learning (PBL): considering the

existing problems, seeking solutions and fostering critical thinking and self-evaluation of results. The teaching-learning methodologies to be undertaken to achieve the proposed learning results are as follows:

M1: Participative lectures. Presentation by the teacher of the main contents of the subject, combined with the active participation of students. This activity will take place present in the classroom. This methodology, supported by individual study of the student (M14), is designed to provide students with the theoretical foundations of the subject content.

M8: Classroom practices. Problems solving and practical cases proposed by the teacher, with the possibility of exposing them by students individually or in groups authorized by the teacher. This activity will take place in person in the classroom, and may require preparatory work by students (M13).

M9: Laboratory practices. The students will developed several practice sessions of 2 hours. This activity will take place in person at the Laboratory 2.03 (Telematics Laboratory - Ada Byron Building). The work will be carried out both individually and in small groups to enhance the applied aspects of design, sizing and planning of transport networks and their traffic management and congestion control: with creative exercises of different complexity, related to the theoretical concepts seen during lectures.

M10: Tutoring. Schedule for student services, both individually and in groups and in any case personalized with the aim of reviewing and discussing the materials and topics presented in both theoretical and practical classes.

M11: Evaluation. Set of oral and written, theoretical-practical and reporting practices or work used in the evaluation of student progress. The detail is in the corresponding section of Evaluation.

## Learning tasks

**The program that the student is offered to help you achieve the expected results includes the following activities...**

**Theoretical sessions**, presented in the classroom, whose main contents are organized in the following thematic units:

- Unit 1. Introduction. Technological, legal and economic context. Overview of transport networks: current technologies and emerging trends. Technical concepts (network segmentation, traffic aggregation, hierarchical groupings, architectures and network structures, protocols and services, virtual private networks). Legal and institutional framework. Trends. Business Models.
- Unit 2. Transport technologies. PDH (Synchronization. Multiplexing. Technical Concepts. Hierarchical group. Frame format. Topology. Settings links. Planning Network. Problematic multi-stage networks. Clos Condition. Lee Method. Graph Theory). SDH (PDH to SDH Evolution. Technical Concepts. Frame format. Pointers. Hierarchical group. Multiplexing structure. Topology. Next Generation NG-SDH). WDM (Technical concepts. Optical Transmission. Optical channels. Topology. Configuring. Migration to WDM. Switching. Routing. Global Network structure. Trends. Optical Network E2E. Optical Switching).
- Unit 3. Protocols and services. X25, Frame Relay and ATM (Evolution from X.25 and FR to ATM. Definitions and comparative. Virtual circuits. Switching. Routing. Architecture protocols. Frame format. Traffic management. Congestion control). Ethernet and Gigabit Ethernet (Introduction. Interconnection elements. Hub, switch, router. Throughput. Switching techniques. GbEthernet. Networks Integration. Converging trends). VLAN and IP (Definition and functional structure. Architecture protocols. Trends. Practical examples. FI-Ware project). MPLS (Introduction. Comparison vs ATM. MPLS. Routing. Switching). VPN (Introduction. IPSec (tunneling). VPN networks. MPLS networks. NGN networks).
- Unit 4. Challenges and trends. Next-generation networks. Introduction. NGN. Vision of the future of telecommunications. Evolution of NGN. Migration control plane functions to the transport plane. Architectures. Generalized MPLS (GMPLS). Operational advantages. Standardization. Mobile-fixed convergence. Mobile-WiFi/WiMax convergence. Challenges and trends. New service models.

**Problem sessions and case studies.** Parallel to the theoretical sessions, students will arise both an mentored work subject as a collection of problems which aims to help strengthen the concepts worked in the theoretical sessions. In addition, the sharing of resolving such problems the student promises to be critical in the presentation of results as well as proposals made by their peers. This activity combines non-contact part of individual study, in which each student presents solutions to the proposed problems, along with other physical working party in which they share the answers of all students.

**Laboratory class sessions**, aimed at the development of techniques and procedures seen in theoretical and applied problems in the world of telecommunications sessions. The breakdown of laboratory practice and the timetable will be implemented at the beginning of the academic year, based on schedules set by the school and the availability of both students and laboratory practices.

**Professional events**, which aim to make real contact with technologies widely used in the business world. The detail of the companies and their timetable will be implemented at the beginning of the academic year, based on schedules set by the school and the availability of both students and enterprise staff.

## Syllabus

### Unit I. Introduction

T0. Technological, legal and economic context

### Unit II. Transport technologies

T1. Plesiochronous Digital Hierarchy (PDH)

T2. Synchronous Digital Hierarchy (SDH)

T3. Wavelength Division Multiplexation (WDM)

### Unit III. Protocols and services

T4. X.25 / Frame Relay / ATM

T5. Ethernet and Gigabit Ethernet

T6. Traffic management and congestion control

T7. VLAN. IP. MPLS

T8. VPN. Next-generation networks. NGN

### Unit IV. Challenges and Trends

T9. Challenges and Trends

T10. Enterprise networks. Success stories

## Course planning and calendar

### Schedule sessions and presentation of works

The timing of the subject and the scheduling of the classroom, theoretical lectures, practical activities and laboratory sessions will be defined by the center in the academic calendar of the corresponding course. The dates for tests, evaluations and other planned activities will be indicated well in advance by the teacher.

## Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- [BB] Gallo, Michael A.. Comunicación entre computadoras y tecnologías de redes / Michael A. Gallo, William M. Hancock México [etc.] : Thomson, cop. 2002
- [BB] Halsall, Fred. Comunicación de datos, redes de computadores y sistemas abiertos / Fred Halsall . - 4a. ed., 1a reimpr. México [etc.] : Addison-Wesley Iberoamericana, 1998
- [BB] Kurose, James F. Computer networking : a top-down approach / James F. Kurose, Keith W. Ross . 7th ed., global ed. Boston [etc.] : Pearson, cop. 2017
- [BB] Stallings, William. ISDN and Broadband ISDN with Frame Relay and ATM / William Stallings . - 4th ed. Upper Saddle River, New Jersey : Prentice Hall, cop. 1999
- [BC] Comer, Douglas E.. Internetworking with TCP/IP. v.1, Principles, protocols, and architecture / Douglas E. Comer . - 4th ed Upper Saddle River, New Jersey : Prentice Hall, cop. 2000
- [BC] Stevens, W. Richard. TCP/IP illustrated. Vol. 1, The protocols / W. Richard Stevens . - [20th. print.] Reading, Massachusetts [etc.] : Addison-Wesley, 2001

Listado de URL

- IETF Request For Comments (RFC): documentos de especificaciones (varios) [<http://www.ietf.org/rfc.html>]