

Academic Year: ( 2023 / 2024 )

Review date: 05-09-2023

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: BANCHS ROCA, ALBERT

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- Access Networks and Shared Media
- Communications Networks and Services

## OBJECTIVES

This course addresses the transmission of multimedia contents over the Internet. The goal is to analyze and design the mechanisms used by multimedia applications to transmit audiovisual content over a best-effort network such as the Internet. To achieve this goal, the student should acquire the knowledge and abilities described next.

Regarding the knowledge gained with this course, by its end the student will be able to:

- Understand the type of service offered by the current Internet and the limitation of this service in order to serve multimedia content
- Identify the different types of the multimedia applications used in the Internet and their different requirements.
- Get to know the mechanisms used by multimedia applications in the Internet.
- Get to know the specific mechanisms used for point-to-multipoint communications
- Understand the differences between the mechanisms used in the current Internet and the ones suited for the next-generation Internet architecture with Quality of Service capabilities.

As far as abilities are concerned, these can be classified in two groups: abilities that are specific to this course and other generic ones that have a more global scope.

The student will develop the following specific abilities by the end of the course:

- Design of multimedia services to achieve an effective transmission of multimedia content over the Internet
- Optimal configure the different mechanisms at the network layer for the transport of multimedia contents
- Develop services for robust transport of audio contents
- Understand and analyze the global behavior of a network that supports data traffic as well as multimedia traffic

Regarding the generic abilities and skills, the following ones will be addressed during the course:

- Ability for team work
- Ability to read and understand up to date literature as well as presenting it
- Getting familiar with widely used network technologies in the Internet area
- Ability to understand and use manuals and handbooks to operate network equipment

## DESCRIPTION OF CONTENTS: PROGRAMME

The course addresses first the design of multimedia applications and underlying techniques for the transport of audiovisual contents, and then addresses the evolution of the network architecture to better support the transport of this type of content. The course is divided into the following four parts:

1. Introduction
  - 1.1. Current Internet architecture and underlying service model
  - 1.2. Multimedia applications and their requirements
2. Multimedia Services in the Next-generation Internet
  - 2.1. Multimedia services with Quality of Service
  - 2.2. Differentiated Services Architecture

## 2.3. Configuration of DiffServ routers

## 3. Multimedia services over the Internet

### 3.1. Delay adaptation for streaming and interactive applications

### 3.2. Rate adaptation techniques

### 3.3. Error control

## 4. Distribution of multimedia content over the Internet

### 4.1. Error and congestion control with multicast

### 4.2. Heterogeneous networks

### 4.3. Techniques for video on demand

### 4.4. Caching techniques

### 4.5. Overlay networks

## LEARNING ACTIVITIES AND METHODOLOGY

The following teaching methods will be used in the course:

- (1) Lectures where theoretic and conceptual content will be provided to the students. To complement these lectures, material on lecture notes will be provided to the students in advance so that they can study these material and learn those topics in which they are most interested
- (2) Laboratory work, where students will develop multimedia services in practice and evaluate their performance
- (3) Exercises and homework to allow students to evaluate their knowledge and acquire the necessary abilities to solve problems
- (4) Interactive lectures to solve the exercises, with the goal of strengthening the knowledge of the students and also to acquire the ability to analyze problems and communicate the related relevant information

## ASSESSMENT SYSTEM

The assessment will be based on the following criteria:

- Assessment of laboratory work, exercises and deliverables (15%): students will perform the laboratory work in pairs and will deliver several exercises along the course. The professor will correct and assess all these activities.
- Intermediate exam I (25%): this exam will assess the knowledge and abilities of the students in the middle of the course.
- Intermediate exam II (25%): this exam will assess the knowledge and abilities of the students in the middle of the course.
- Final exam (35%): this exam will assess the knowledge and abilities of the students at the end of the course.

<b>% end-of-term-examination:</b>	35
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<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	65
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## BASIC BIBLIOGRAPHY

- F. Kuo, W. Effelsberg, J.J. Garcia-Luna-Acebes Multimedia Communications: Protocols and Applications, Prentice Hall, 2000
- H. Wu, Y. Pan Medium Access Control in Wireless Networks, Nova Science Publishers, 2008
- Ivan Vidal, Ignacio Soto, Albert Banchs, Jaime Garcia-Reinoso, Ivan Lozano, Gonzalo Camarillo Multimedia Networking Technologies, Protocols, and Architectures, Artech House, 2019
- J.F. Kurose, K.W. Ross Computer Networking: A Top-Down Approach, Pearson, 2013
- S. Ahson and M. Ilyas: VoIP Handbook: Applications, Technologies, Reliability, and Security, CRC Press, 2009

## ADDITIONAL BIBLIOGRAPHY

- K. Kilki Differentiated services for the Internet, Macmillan Technical Publishing, 1999
- M. van der Schaar, P. Chou Multimedia over IP and Wireless Networks: Compression, Networking, and Systems, Elsevier, 2007

## BASIC ELECTRONIC RESOURCES

- Albert Banchs, Ignacio Martin . Redes Multimedia: <http://ocw.uc3m.es/ingenieria-telematica/redes-multimedia>