



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Sistemi e Servizi di Telecomunicazione

2122-1-F1801Q129

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#### Aims

Provide the notions necessary to understand the main network design and management issues, in the multimedia communication, enterprise connectivity and mobile radio networks (from 2G to 5G)

#### Contents

Wired and wireless broadband access networks, WAN connectivity, software-defined networking, voice and multimedia over IP, quality of service in networks, content delivery networks, mobile radio networks (4G and 5G), network management

#### Detailed program

1) Broadband Access Networks:

- Fiber/copper architectures;

- Fiber access;

- Wireless/satellite access.

## 2) WAN connectivity:

- Generalized and dedicated connectivity;
- MPLS protocol.

## 3) Software Defined Networking and Network Function Virtualization:

- Legacy router and switch architecture;
- Firewall, IDS and load balancer architecture;
- Basic principles of SDN;
- OpenFlow protocol;
- Basic principles of NFV.

## 4) Voice and multimedia over IP:

- The audio signal, waveform coding and advanced coding techniques;
- Network delay components and overhead;
- SIP architecture.

## 5) Internet quality of service:

- Service Level Agreement and Traffic Conditioning Agreement;
- Policing, shaping and marking techniques;
- Techniques for QoS guarantees (IntServ, DiffServ).

## 6) Content delivery networks:

- Principles;

- Architecture and techniques.

#### 7) Mobile radio networks:

- Basics on cellular architectures;

- Radio planning;

- 2G (GSM and GPRS);

- 3G (UMTS and HSPA);

- 4G (LTE);

- 5G.

#### 8) Network management:

- Network configuration and failure management;

- Architecture and protocol of management networks.

### **Prerequisites**

Basic notions of TCP/IP networking

### **Teaching form**

Classroom lectures and exercises

The course will be held in Italian, except for the terms in English, which will remain in English

### **Textbook and teaching resource**

On-line material on the course site.

## **Semester**

Second semester

## **Assessment method**

The assessment is carried out through a written test that includes both open questions on the topics of the course, in which a detailed description of one of the problems addressed is requested, and numerical exercises concerning aspects of network sizing, performance and quality of service

## **Office hours**

Monday morning by appointment

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