Computer networks
05KSILM, 05KSIOA, 05KSIPC
A.A. 2021/22

Course Language
Inglese

Course degree
1st degree and Bachelor-level of the Bologna process in Computer Engineering - Torino
1st degree and Bachelor-level of the Bologna process in Cinema And Media Engineering - Torino

Course structure

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Teachers

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<th>h.Les</th>
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Teaching assistant

Espandi

Context

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Statistiche superamento esami (/pls/portal30/esami.superi.grafico?p_cod_ins=05KSILM&p_a_acc=2022)

Anno accademico di inizio validità

2019/20

Course description

The course describes the most common architectures, algorithms and protocols used to implement
computer networks, starting from the physical layer up to the most popular application layer protocols. The course goal is to give the students the elements needed to understand how computer and communication networks work, with particular emphasis to the Internet.

**Expected Learning Outcomes**

The student will gain knowledge on:
- General concepts of computer networks: network classification based on the covered area, network topologies, switching techniques (circuit and packet), multiplexing and multiple access techniques, service models (client-server, peer-to-peer), layered protocol architectures, traffic characterization and QoS requirements.
- Transmission channels, bit encoding techniques, access and transport networks.
- Error recovery and flow control techniques: ARQ window protocols.
- Data-link layer protocols.
- Local Area Networks: architecture, protocols, interconnection.
- Routing algorithms and protocols. Network protocols in the Internet, IP addressing and translation, Multicast IP.
- Internet transport layer protocols.
- Internet application layer protocols.

The ability to apply the gained knowledge will be verified through lab experience and class exercise on course subjects.

**Prerequisites**

Basic skills in computer engineering (first year course level). In particular, the student should be able to perform decima-to-binary and binary-to-decimal conversions, and he/she should have a basic understanding of how a computer works. Understanding of concepts such as frequency spectrum, its energetic interpretation and signal sampling is also requested. The student should also be familiar with basic physics concepts related to optics and electromagnetic fields.

**Course topics**

Classroom lessons will cover the following topics:
- General concepts related to computer networks: classification based on the extension of the physical area covered, circuit and packet switching, connectionless and connection-oriented protocols, layered protocol architecture, requirements for the transmission of audio/video and non real-time data (1,6 CFU)
- Major physical media for data transmission, and related data encoding techniques (0,8 CFU)
- Data-link layer: principles of error recovery and flow control, point-to-point protocols, local area networks. (1,6 CFU)
- Network layer: IPv4, ICMP, ARP, and DHCP protocols, addressing schemes, NAT, Multicast IP. (1,2 CFU)
- Network Analysis tools (0,2 CFU)
- Transport layer: UDP and TCP protocols. (0,7 CFU)
- Application layer: HTTP, SMTP, POP and IMAP protocols, P2P applications, Multimedia communication, VoIP, SIP. (1 CFU)
- Laboratory (0,9 CFU)

**Additional information**
**Course structure**

Exercises in the classroom will cover the following topics:
- Switching techniques
- Sliding window protocols
- Sequence of messages expected to implement a given operation initiated by the user, given a particular network configuration.

Sessions in laboratory will cover packet analysis on real traffic, captured either in passive way or after specific commands entered by students.

**Reading materials**

The teacher will distribute the course material, and it will be available on the web pages of the course.

Additional reading:
- F. Risso, Exercise collections (in English, available on the portal)

**Assessment and grading criteria**

**Exam:** written test; compulsory oral exam; optional oral exam;

1-hour written exam, including 28 multiple-choice questions. Correct answer: 1 point, wrong answer: -0.5 points, empty answer: 0 points.

Oral exam if the total mark of the written test is larger or equal than 16 points. This oral exam is mandatory for marks included in the range 16-20 points, while it is optional for larger marks. The oral exam can increase/decrease the mark of the written test for a maximum of 6 points.

In both exams, it will be evaluated the knowledge level of the explained concepts and topics, by means of both theoretical questions and numerical exercises, that can be given, during the written test, also in multiple-choice question form.

The final grade must be validated by a positive outcome of the final project.