COURSE DETAILS

"RETI DI CALCOLATORI"

SSD ING-INF/05

DEGREE PROGRAMME: BACHELOR DEGREE IN COMPUTER ENGINEERING

ACADEMIC YEAR: 2023-2024

GENERAL INFORMATION – TEACHER REFERENCES

TEACHER: MULTIPLE STUDY COURSE
PHONE:
EMAIL:

SEE THE STUDY COURSE WEBSITE

GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE (IF APPLICABLE): N.A.

MODULE (IF APPLICABLE): N.A.

CHANNEL (IF APPLICABLE): N.A.

YEAR OF THE DEGREE PROGRAMME (I, II, III): III

SEMESTER (I, II): I

CFU: 9

REQUIRED PRELIMINARY COURSES (IF MENTIONED IN THE COURSE STRUCTURE "REGOLAMENTO")
Calcolatori elettronici.

PREREQUISITES (IF APPLICABLE)
None.

LEARNING GOALS
The aim of the course is to provide the first theoretical notions and the necessary operational skills on computer networks and in general on packet-switched communication networks. The course is developed following a top-down approach, thus favoring a vision primarily of application of modern telematic technologies, to then get to the presentation of software and hardware technologies at the base of the realization of telematic systems. The main training objectives are: knowledge of communication needs in modern computer and telematic applications; the characteristics of packet-switched communication technologies; the basic models for the design of a computer network; the basic characteristics of TCP/IP architecture and the Internet; the main technologies currently used in both wired and wireless local networks; the basic problems related to the secure management of networks and telematic systems; basic skills for distributed programming based on the client/server model; adequate operation in the basic configuration of simple network systems based on TCP/IP architecture; the ability to use simple tools for monitoring, managing and configuring computer networks.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding
The student must demonstrate knowledge of the fundamental concepts that inspire the design of the various levels of a network system. In particular, the student must demonstrate understanding and ability to describe the communication protocols described in the course and ability to understand the advantages, limitations and tradeoffs of the technologies and protocols studied..

Applying knowledge and understanding
The student must demonstrate to be able to apply the techniques and knowledge learned for the solution of simple problems of network configuration, analysis of protocols and traces of network traffic. The student must also demonstrate that he has acquired the ability to use simple software tools for network analysis and simulation of network systems.

COURSE CONTENT/SYLLABUS
Part I – General concepts.
Computer networks and network services. Layered architectures of computer networks. The ISO/OSI model. Packet-switched networks. Communication protocols. Quality of Service in packet-switched networks. Datagram networks and virtual circuit networks. The TCP/IP protocol stack and the IETF.
Part II - The application layer.
Characteristics of application protocols. The client/server paradigm. HTTP, FTP, SMTP protocols. The DNS system. The peer-to-peer paradigm. Development of distributed software and the API socket and its use in C and Python languages.
Part III - The transport layer.
Techniques for reliable end-to-end transmission. Go-back-N and Selective Repeat. End-to-end techniques for error, flow and congestion control. TCP, UDP and RTP protocols. Congestion control in TCP. Fairness. Checksum.
Part IV - The mesh layer.
The IP protocol. Management of addressing in IP networks. Subnetting. NAT. Il protocollo IPv6. Unicast and multicast routing in an intra-domain environment. Routing distance-vector and link-state. The RIP and OSPF protocols. Hierarchical routing on the Internet. Autonomous System. Overview of inter-domain routing. Internet Exchange Points. Relationships between Autonomous Systems.
Part V - LAN networks.
Shared access techniques in the LAN environment. Aloha. CSMA/CD. Ethernet technology and its evolution.

LAN interconnection: bridging and switching. VLAN. Structured cabling systems. LAN connection to the geographical network: access technologies. Local Area Network Management: addressing, NAT and DHCP services, VLAN services. Wireless LAN and PAN networks: 802.11 and Bluetooth technologies.

Part VI - Techniques for secure communication on the network.

Cryptographic techniques. Cryptographic hash functions. Digital signature.

Part VII – Exercise activities

Configuring a TCP/IP network. Using a network simulator/emulator. Network monitoring. Software tools for network analysis. Analysis of traces of network traffic.

READINGS/BIBLIOGRAPHY

- J. Kurose, K. Ross, "Reti di calcolatori e Internet. Un approccio top-down", (7a ed.) - Pearson 2017
- Lesson slides

TEACHING METHODS

The course consists of: a) lectures for about 80% of the total hours; b) practical exercises for the remaining 20%.

EXAMINATION/EVALUATION CRITERIA

a) **Exam type:**

Exam type	
written and oral	X
only written	
only oral	
project discussion	
other	

In case of a written exam, questions refer to:	Multiple choice answers	X
	Open answers	
	Numerical exercises	

b) **Evaluation pattern:** The outcome of the written test is binding for access to the oral test.