UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Reti e Sistemi Operativi (blended)

2324-2-E3101Q110

Aims

The student shall learn what are the main abstractions and services that a modern operating system offers, how to use them, and the basic concepts about the architectures and implementation strategies of modern operating systems. Moreover, the student will acquire knowledge about the fundamental architecture and protocols of TCP/IP telecommunication networks.

Contents

Introduction to operating systems, Processes and threads, CPU scheduling, Memory management - main memory, Memory management - virtual memory, File system, Introduction to Networks and the Internet, Application Layer, Transport Layer, Network Layer - Data Plane, Network Layer - Control Plane, Link Layer and Local Area Networks.

Detailed program

Operating Systems

1: Introduction to operating systems:

- Structure of operating systems
- Services offered by operating systems
- System calls

2: Processes and threads:

- Processes and their management
- Interprocess communication
- Threads and multithreading programming

3: CPU scheduling:

- Main CPU scheduling algorithms (first-come first-served, shortest job first, round-robin, priority)
- Multilevel queues with feedback

4: Memory management - main memory:

- Contiguous allocation
- Paging
- Swapping

5: Memory management - virtual memory:

- Virtual memory
- Degree of multiprogramming
- Page allocation and substitution
- Thrashing

6: File system:

- Files and attributes
- File system structure and organization models
- Secondary storage organization

Networks

7: Introduction to Computer Networks and the Internet:

- Network architecture
- Definition of protocol
- Packet switching
- Layered architecture and encapsulation

8: Application Layer:

- Domain Name System (DNS)

9: Transport Layer:

- UDP protocol
- Principles of reliable data transfer (Stop-and-Wait, Go-Back-N, Selective Repeat)
- TCP protocol

10: Network Layer - Data Plane:

- Router architecture
- IPv4 protocol and IPv4 addressing
- Network Address Translation (NAT)

11: Network Layer - Control Plane:

- Routing algorithms (Link State, Distance Vector)
- Interior Gateway Routing Protocols (OSPF)
- Border Gateway Protocol (BGP)
- Internet Control Message Protocol (ICMP)

12: Link Layer and Local Networks:

- Offered services
- Multiple Access Protocols (Random Access Protocols, Taking-Turns Protocols)
- Switch architecture
- Ethernet protocol
- Link Layer addresing and Address Resolution Protocol (ARP)

Prerequisites

The fundamental concepts taught in the following courses: Computer Architecture, Programming 1 and Programming 2

Teaching form

Classroom lectures, e-learning exercises and self-assessments and on-line tutoring.

The course will be held in Italian.

Textbook and teaching resource

A. Silberschatz, P. Galvin, G. Gagne, "Sistemi Operativi - concetti ed esempi", 10th Edition, Pearson, ISBN: 978-88-9190-455-3 (also available in English, entitled "Operating Systems Concepts", 10th Edition)

J. Kurose, K. Ross, "Reti di Calcolatori e Internet", 8va Edizione, Pearson, ISBN: 978-88-9191-600-6 (also available in English, entitled “Computer Networking: A Top-Down Approach”, 8th Edition)

Slides of lessons, exercises and other material will be available on-line

Semester

Second year, first semester.

Assessment method

The assessment consists in a written test, with the possibility of partial intermediate tests (*in itinere*).

There are two *in itinere* tests and are held in the middle and at the end of the course. It is necessary to pass both of them to pass the exam. In the event that one of the two *in itinere* tests has not been passed or has not been sustained, it is possible to recover it in the first exam session, provided that the other test has been positively passed. Passing only one of the two *in itinere* tests does not give rise to any bonus for the subsequent full examination tests.

The tests include both multiple choice questions and open-ended questions, requiring a reasoned argument on one of the course topics.

Office hours

Prof. Braione: by appointment via email.

Prof. Savi: by appointment via email.

Sustainable Development Goals