UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Distributed Systems

2122-2-E3101Q112

Aims

Students will know the characteristic properties and reference organizations of concurrent, client-server, and peer-to-peer distributed systems. They will be able to develop simple distributed applications in Web/Internet environments.

Contents

Concepts, models and architecture of concurrent and distributes systems. Fundamentals of design and behavior of distributed systems, with specific reference to the Web and the Internet.

Detailed program

1. Basic concepts: definition and characteristic properties; client-server and peer-to-peer models; Software architectures (layers vs tiers); naming, identifier, and address (URI e DNS);
2. Basic technologies
   Socket TCP/IP: client-server and application protocols.Client/server and peer-to-peer models. Communication by procedure call: Remote Procedure Call (RPC) and Remote Object Invocation (Java RMI).
3. Web Applications
   Web Foundations (URI & HTTP) HTTP request/response. Web applications:
   servlet/JSP Pattern MVC. Client Web: Browser: Rich Interface Applications (Ajax).
   Web services: REST and Web API vs WSDL/SOAP.
4. Dynamic Web applications
   Introduction to JavaScript; introduction to the jQuery framework; jQuery and AJAX techniques Sample web applications: basic JavaScript examples, debugging, dynamic web page modification, remote services

invocation.

5. HTML5 & CSS as a model for data representation and presentation XML/ JSON as a model for data transfer RDF as a data model for the semantic web SPARQL as query language for the semantic web Sample semantic web applications: querying DBPedia and other SPARQL endpoints, simple mashups.
6. Concurrent programming: synchronization and monitors. Models based on shared memory multi-thread programming in Java. Hints of finite-state automata modeling.

Prerequisites

Principles of Object-Oriented programming in java and Junit tests (Programming 2); Process and Interprocess Communication (Network and Operating Systems); TCP/IP protocol and Sockets (Network and Operating Systems); Markup languages (XML and HTML), related manipulation tools, and Finite State Automata (Languages and Computability) .

Teaching form

The course includes theoretical and exercises lectures integrated by individual study activities with e-learning support. Individual and group laboratory activities to develop simple distributed systems and Web applications will be also part of the course.

Teaching language: Italian

Textbook and teaching resource

On the e-learning site are available :

- slides of the lessons in pdf format.
- further material (articles to complete the reference texts, links to online resources, exercises to be carried out).
- equipment and solutions for exercises carried out in the laboratory.

Textbooks:

Distributed Systems: Principles and Paradigms - 2nd edition, Andrew S. Tanenbaum and Maarten van Steen, Pearson - Prentice Hall, 2007.

Already adopted in the course of Networks and Operating Systems:

Reti di calcolatori e internet – Un approccio top-down 4a Edizione, James F. Kurose, Keith W. Ross Addison Wesley – 2008, ISBN 9788871924557
Chapter 1, 2

A. Silberschatz, P. Baer Galvin, G. Gagne, Sistemi operativi - Concetti ed esempi, 8/Ed. 2009, ISBN 9788871925691
Chapter 3, 4, 6, 7, 16

Semester

Second semester

Assessment method

Examination: separate written test and optional oral exam -> up to 30 points
Laboratory -> up to 4 points

The test deals with:
(a) questions on the concepts presented
(b) requests for reasoning and deduction
(c) resolution of exercises that require the development of a solution to an assigned problem

Written test in the laboratory
Phase 1: Fixed-choice questions. Admission to a second phase with 50% of correct answers.
Phase 2: Mixed questions (essay or fixed choice with comments)
The exam is passed with a score >= 18/30
Oral exam (optional)
It consists on the restitution of written tests with discussion, and any additional questions at the teacher's discretion.

Laboratory
Evaluation: final project -> up to 4 points
Alternative for student workers: PROJECT to be agreed with teachers -> up to 4 points

In itinere tests (replace exam)
First test: Closed questions
Second test: Closed questions + mixed questions
Whoever has scored >= 18/30 in the first test is admitted to the second test. There are no recovery tests.

It is possible to make additional work projects (optional, evaluated)

FINAL VOTE = EXAMINATION (+ optional work project)
FINAL VOTE for working students = EXAMINATION (+ optional PROJECT)

Office hours

Prof. De Paoli: Thursday from 10:00 to 12:00 or by appointment by writing to flavio.depaoli@unimib.it

Prof. Vizzari: Wednesday from 9:30 to 11:30 or other days/times always by appointment.

Prof. Ciavotta: Tuesday from 12:30 to 14:30 by appointment.

Questions and discussions on teaching topics can be posed using the forums in e-learning.