UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Distributed Systems Technologies and Applications

2122-2-F9201P030

Aims

The goal of the course is to provide students with fundamental elements to understand and design collaborative and service-oriented Web applications. After the course, students will master the most important models for distributed systems based on Web technology, and the basic characteristics of languages and tools for their development.
They will be able to analyze existing systems and be part of teams that develop Web applications, with focus on front-end development.

Contents

Current distributed applications exploits the Web as a reference platform, and the concept of service as a metaphor for building independent components that implement the requested functionalities. This course studies the emerging distributed software technology principles and models with respct to design of interactive Web applications.
The evolution of interaction and communication paradigms in current scenarios ("Cloud Computing" and "Internet of Things" (IoT) applications) will be analyzed. The course includes a relavant practical part devoted to learning basic programming principles in JavaScript and development of Ajax (HTML5, CSS3, JavaScript, JSON) and Node.js applications. The main frameworks for the development of interfaces and interaction in desktop and mobile environments will be introduced.

Detailed program

- Introduction. Evolution of the Internet and the Web: network, devices and applications convergence. Introduction to basic communication principles with Internet (TCP/IP protocol) and the Web (HTTP protocol). The REST (Web API) architectural style: Web of Services, Web of Data, and Web of Things.

- Service-oriented systems (overview): Definition of service and service model; service oriented architecture (SOA); Service Science: business processed and design alternatives; Principles and models of Cloud and Fog computing and their impact on organizations and design of business solutions: system-of-record and system-of-engagement models. Principles and technology for systems of engagement: mobility and Ajax active interfaces.
- Information exchange: overview of syntax and semantics (XML, JSON, Linked Data, RDF).
- Interface and interaction design: Ajax-related technology (HTML5, CSS3, JavaScript). Introduction to computer programming with JavaScript. Development of Ajax applications with JQuery, Boostrap and React (front-end) and Node.js (back-end).

Prerequisites

It is highly advisable that students had already understood basic networking and distributed system principles; anyway the introductory part of the course will recall the basic concepts.

Teaching form

The course includes theoretical and exercise (laboratory) lectures integrated with individual study activities with e-learning support.

Teaching language: Italian

Textbook and teaching resource

There is not a single reference textbook. Articles and resources will be indicated and/or published on the e-learning site.

Semester

First semester

Assessment method

The examination consists of a written test with open-answer and multiple-choice questions (on lecture and laboratory topics) with a value of 30 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

Structure of the written test:

General part: 11 closed + 2 open questions (11*2 + 2*4 = 30 points)

Students that attended the laboratories can obtain 5 additional points thus awarded:
1 point for frequency (>=75%)
1 point for active participation (carrying out of classroom exercises)
3 points for the performance of the final exercise (agreed with the teacher)

The exam may be supplemented by an oral exam at the request of the teacher and/or student.
The oral test may result in an increase or decrease in the mark in the written test.

In-itinere examination
The written test may be replaced by two in-itinere tests.
Each test shall consist of open-answer and multiple-choice questions, with a value of points 32.
Access to the second test will be obtained by scoring 18 or more in the first test.
The marks in the written test are given by the average of the two tests. No recovery tests are foreseen.

FINAL MARK = WRITTEN MARKS + LABORATORY MARKS (if attended) + (possible oral integration)

In the Covid-19 emergency period the written test will be replaced by a supervised remote test: a session with open/closed questions on the e-learning site with active monitoring by the teachers, and an oral session in teleconference. The in-itinere tests may not be held.

Office hours

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

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