# Laboratory of cloud computing big data and security

## Prof. Marco L. Della Vedova, Prof. Federico Accetta

### COURSE AIMS AND INTENDED LEARNING OUTCOMES

This course presents an overview of cloud computing paradigms with the aim at developing applications that take advantage of cloud technologies. The main topics include cloud architectures, distributed/parallel computing in the cloud, distributed storage systems, virtualization and cloud services. The course is structured in two modules. The first module provides students with an overview of cloud computing technologies and emerging trends, whereas the second module is aimed at describing the most popular frameworks adopted for developing cloud-based solution for big data problems.

At the end of the course students will be able to devise solutions based on cloud computing for classes of problems and to take advantage of modern cloud offering to identify optimal resource provisioning for their solutions.

### COURSE CONTENT

**Module 1**: Cloud Computing Technologies (6 CFU, Prof. Della Vedova)

* Review of the basics: computer architecture, computer networks
* Introduction to Cloud Computing
* Service models on Cloud: IaaS, PaaS and SaaS
* Cloud services: Storage, Infrastructure, Computing, Data, etc.
* Virtualization: VMs and containers
* Parallel/distributed computing. Distributed storage systems
* Microservices and serverless computing
* Introduction to Big Data
* NoSQL databases
* Batch analysis: MapReduce patterns
* Real-time analysis: stream processing and in-memory processing
* Principles of Information Security

**Module 2**: Cloud solutions applied to big data (6 CFU, Prof. Accetta)

* Cloud native development
* Microservices
* Containers and orchestration (Kubernetes)
* Development lifecycle: continuous integration and continuous deployment, working with git
* Working with databases
* Event driven architecture and streaming analytics
* Security on the cloud
* Tools and resources on the cloud for data science projects
* Series of hands on labs focused on the creation of an application based on microservices on different deployment options (kubernetes and serverless)

### READING LIST

During the course instructors will provide link to public available online material and textbook references.

### TEACHING METHOD

The course will include lectures and class exercises based on traditional teaching and teach by example principles. It is strongly advised to attend lectures for working on case studies and examples, and for revising materials.

The course also involves hands-on activities with a cloud based integrated environment.

### ASSESSMENT METHOD AND CRITERIA

At the end of each module there will be a mid-term exam. The final exam score is the average score of Module 1 and 2 results.

The exam of Module 1 consists of a multiple-answers test and an oral interview aimed at assessing students' understanding of cloud technologies and tools.

The exam of Module 2 consists of a multiple-answers test and an oral interview about the content of the course and the labs.

The assessment will also consider the active participation in the course, especially during the exercise classes.

### NOTES AND PREREQUISITES

***Prerequisites:*** Knowledge of the basic principles of computer operation and of the Internet is required for Module 1. Basic programming skills and a mid-level knowledge of Python programming language is required for Module 2.

***Day and reception hours:*** Students can contact the instructor by e-mail to arrange for day and reception hours at the instructor’s workplace.