Syllabus

Course description

Course title	Cloud Computing and Distributed Systems
Course code	76061
Course title additional	/
Scientific sector	INFO-01/A
Teaching language(s)	English
Degree course	Master in Software Engineering
Other degree courses (loaned)	/
Lecturer(s)	dr. Florian Hofer, Florian.Hofer@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/37220
Teaching assistant(s)	/
Semester	2
Course year	1
CP	6
Teaching hours	40
Lab hours	20
Individual study	90
Planned office hours	18
Contents summary	Distributed Systems Principles Network Technologies Virtualization Distributed Systems: Internet-of-Things, Edge Computing, Blockchain Cloud Systems Principles Cloud Security
Course content	In recent years, cloud computing has transformed the ICT landscape, with both public and private infrastructures supporting many digital services and data. Technology providers and developers are increasingly adopting technologies such as virtualization, containerization, and microservices. Consequently, new cloud-native applications are

	emerging, capitalizing on the scalability and reliability of cloud services.
	This course provides a comprehensive introduction to cloud computing and distributed systems through a practical approach. By the end, you will (1) understand distributed systems fundamentals and cloud computing models and technologies, (2) gain knowledge in networking, orchestration, and security, and (3) effectively use advanced platforms to manage cloud infrastructures and orchestrate workloads.
Keywords	Cloud, Microservices, Edge, Container, Virtualization
Prerequisites	Basic coding skills, basic operating systems and networking knowledge
Propaedeutic courses	/
Teaching format	The course combines interactive lectures with practical project work and lab exercises to provide both theoretical foundations and hands-on experience with clouds and distributed systems.
Mandatory attendance	Attendance is not compulsory, but non-attending students must contact the lecturer at the start of the course to agree on the modalities of independent study.
Specific educational objectives and learning outcomes	Knowledge and understanding
	D1.3 have an in-depth knowledge of the scientific method of investigation applied to even complex systems and innovative technologies that support information technology and its applications;
	D1.5 know the fundamentals, techniques and methods of design, customisation and implementation of software to support the automation of new-generation information systems for industrial production and company business;
	Applying knowledge and understanding
	D2.4 ability to define an innovative technical solution to an application problem that respects technical, functional and organisational constraints and requirements;
	Making judgments
	D3.1 ability to independently select documentation from various sources, including technical books, digital libraries, technical scientific journals, web portals or open source software and hardware tools;
	D3.4 ability to reconcile conflicting project objectives, find acceptable compromises within the limits of cost, resources, time, knowledge or risk;
	Communication skills
	D4.2 ability to structure and draft scientific and technical descriptive documentation of project activities;
	D4.4 ability to prepare and deliver presentations with technical content in English;
	D4.5 ability to interact and collaborate in the realisation of a project or research with peers and experts;
	Learning skills:
	D5.1 ability to independently extend the knowledge acquired during the course of study by reading and understanding scientific and technical documentation in English;
	D5.3 in the context of a problem solving activity, ability to extend even

	incomplete knowledge with regard to the final objective of the project
Specific educational objective and learning outcomes (additional information)	The course belongs to the type caratterizzanti - discipline informatiche.
	The Cloud Computing and Distributed Systems course focuses understanding, designing and implementing distributed and cloud systems to solve real life problems. The main educational objectives of the course are:
	Understand the core concepts of distributed systems and cloud computing
	Cloud infrastructure from the ground up
	Analyze trade-offs between cloud deployment models and providers
	Distributed systems
	Performance, scalability, and availability measurements in the cloud
	Security and privacy in cloud computing
	Edge computing technologies
	Address real-world problems using cloud computing
Assessment	The assessment of the course consists of an oral exam and a project. For the project, the students are required to implement a distributed system or cloud-based solution for specific problems (e.g., auto-scaling, security, performance, consensus). The project will focus on one or more topics covered during the lectures and labs. The outputs of the project are:
	a written report describing problem statement, proposed solution, system design and architecture, functionality, development problems/solutions (D1.3, D2.4, D3.1, D3.4, D4.2)
	a working demo of the application (D1.5, D5.1, D5.3)
	a project presentation (D4.4, D4.5)
	The project grade can optionally be integrated through lab exercises, practice test and experience reporting.
	The oral exam will evaluate the student's knowledge (D1.3, D1.5) and how this knowledge can be applied to specific problems (D2.4). It will assess proficiency in communicating technical content effectively to diverse audiences through well-structured scientific documentation and presentations (D4.2, D4.4). The course labs and activities will evaluate their decision-making capacity in the context of Cloud Computing (D3.4), exercising their communication skills (D4.2, D4.5).
Evaluation criteria	The evaluation of the course is weighted as follows:
	Oral exam 50%;
	Project, integrated with lab exercises, 50%.
	Note: Positive project results are necessary to attend the oral exam.
	Projects must be evaluated BEFORE the final exam, otherwise the exam cannot be registered.
	In case of a positive mark, the project will count for the remaining regular exam sessions.
Required readings	Erl, T., Puttini, R., Mahmood Z., Cloud Computing. Concepts, Technology & Architecture, 2nd Edition, Pearson, 2023, ISBN: 978-0138052256

	(available through UniBz online library)
	Lecture slides.
	Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
Supplementary readings	Coulouris, G., Dollimore, J., Kindberg, T., Blair, G., Distributed Systems. Concepts and Design (5th Edition), Pearson, 2011, ISBN: 978-0132143011 Hardcover, 978-0273760597 Paperback
	Woolf, B., Cloud Application Architecture Patterns: Designing, Building, and Modernizing for the Cloud, O'Reilly Media, 2025, ISBN: 978-1098116903 (available through UniBz online library)
	Aws: The Complete Guide From Beginners To Advanced For Amazon Web Services, 2019, 979-8477732074
	Online resources: https://aws.amazon.com/getting-started/
Further information	
Sustainable Development Goals (SDGs)	Decent work and economic growth, Industry, innovation and infrastructure, Responsible consumption and production.