COURSE DESCRIPTION CARD - SYLLABUS

Course name
Construction of cloud computing systems [S2Inf1-SRC>KSCH]

Course

Field of study
Computing

Year/Semester
1/2

Area of study (specialization)
Distributed and cloud systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
45

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Student starting this module should have a basic knowledge in the field of: operating systems, computer networks, distributed computing, security of information systems, and database systems. The student should be able to obtain information from indicated sources, and be able to cooperate in groups.

Course objective

Transfer of basic knowledge concerning the design and operation of modern distributed cloud computing systems. Discussed topics cover technical issues concerning: virtualization, data storage systems, monitoring, and management of cloud computing systems.

Course-related learning outcomes

Knowledge:
1. has knowledge of cloud computing models.
2. has detailed knowledge of operating system virtualization technologies, including containerization.
3. has detailled knowledge of models and organization of scalable data storage systems.
4. has knowledge of remote management technologies of large computer systems.

Skills:
1. is able to implement, configure, and optimize virtualization systems and distributed data storage systems.
2. is able to design clound computing systems of small scale, tailored to specific requirements.
3. is able to diagnose, monitor, and remotely manage the implemented cloud system.

Social competences:
1. understands that in the field of it the knowledge and skills quickly become obsolete.
2. is able to cooperate in a group.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The course is passed on the basis of a written test consisting of 5 problem-related questions. For each question you can get 12 points, a positive assessment requires at least 30 points.

Programme content

The lecture program includes the following topics:
1. Virtualization of operating systems: applications, models, hardware support, paravirtualization, management of memory and I/O devices, partitioning and aggregation of computing power.
2. Operating system level virtualization (containerization), process isolation mechanisms, scheduling of processes within containers, resource allocation, migration of containers between servers.
3. Cloud computing: economic motivations, processing models: IaaS, PaaS, SaaS, billing models, cloud computing and grid environments, performance scaling, private clouds, hybrid clouds, barriers to the development of cloud computing, standardization, security.
4. Data storage systems: disk arrays, SAN networks, NAS, Fiber Channel, iSCSI protocol, multi-path I/O, cluster file systems: OCFS2, VMFS, DRBD block replication mechanism.
5. Highly scalable data storage systems: GlusterFS, Ceph. Architecture, partitioning and replication models.
6. Mechanisms of remote management of computer systems.

The program of laboratory classes includes the following topics:
1. Virtualization: VirtualBox, remote access, networking, migration, virtual disks, management and monitoring.
2. Virtualization: QEMU, KVM, libvirt, VMware tools (vSphere Hypervisor).
3. Operating system-level virtualization: Linux Containers (LXC), Docker.
4. Tools for remote administration of computer systems (RAC, KVM, IPMI, Intel vPro).
5. Mass storage systems: disk arrays, SAN, NAS, iSCSI protocol, replication (DRBD), cluster file systems (OCFS2).
6. Large-scale distributed file systems: Ceph, GlusterFS.
7. Virtualization management environments: OpenNebula, VMware vSphere.
8. Monitoring, accounting and evaluation of distributed cloud computing systems.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board, discussion.
2. Laboratory: 3-hour laboratory exercises, carried out individually or in teams of 2-4 people, depending on the nature of the exercises. The aim of the exercises is to run, configure and test the presented mechanisms and technologies.

Bibliography

Basic
1. System documentation of service systems and distributed environments.
2. White papers describing particular mechanisms and technologies.

Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50