POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
System administration [S2Inf1-SRC>ZSK]

Course

Field of study
Computing

Year/Semester
1/1

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	Laboratory classes	Other
15	30	0

Tutorials	Projects/seminars	
0	0	

Number of credit points

3,00

Coordinators

dr inż. Cezary Sobaniec
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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

1. Provide students with basic knowledge of the functioning of services in distributed systems (directory services, distributed file systems, cluster systems) and system management mechanisms (software management, backup and recovery). 2. Developing students skills in solving problems related to the implementation, configuration and diagnostics of service software in distributed systems. 3. Shaping students team work skills.

Course-related learning outcomes

Knowledge:
1. has knowledge of the issues of local computer systems management in the field of: software management, local file systems operations (including volume managers, snapshots, extended attributes).

2. has detailed knowledge of the issues of backup and recovery of information systems.
3. has detailed knowledge of the functioning of directory services on the example of the ldap directory service and a windows domain controller.
4. has detailed knowledge of distributed file systems, including nfs, smb/cifs file systems.

Skills:
1. can set up system services (installation, configuration, tuning).
2. can perform monitoring and diagnostics of system services.
3. can carry out simple experiments to verify the performance of services.

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 assessed through a written test consisting of 5 problem-related questions. For each question one can get 12 points, a positive assessment requires at least 30 points.

Programme content

1. Local file systems and volume managers.
2. Management of system and application software.
3. Backup and recovery.
4. Directory services.
5. Distributed file systems.

Course topics

The lecture program includes the following topics:

1. Local file systems: journaling, file systems for SSD/NVMe devices, read-only file systems, user space file systems (FUSE), in-memory file systems, extended attributes, file system grouping, volume managers, snapshots, copy-on-write mechanism (CoW), thin provisioning, file systems with CoW.
2. Software management: system directory structure, software packages, package granularity, dependencies, shared libraries, RPM and DEB packages, the process of creating, installing and updating packages, package repositories, OpenPKG system.
3. Backup and recovery: inventory, backup levels, incremental backup, backup schemes, data carriers, RAID systems, file systems, versioning, deduplication, Rsync protocol, BackupPC, Borg, continuous data protection systems.
4. LDAP directory service: applications, data schemas, structure, partitioning, tree searching, protocol operations, OpenLDAP server, replication mechanisms, access control, API, Microsoft Active Directory.
5. Distributed file systems: file and directory services, access models, transparency levels, interface, sharing semantics, statelessness, cache, replication, systems: NFS, AFS, Coda, Google FS, OCFS, GFS.

The program of laboratory classes includes the following topics:

1. Local file systems: loop interface, NTFS, SquashFS, extended attributes (xattr), dynamic resizing, in-memory file systems, UnionFS, Logical Volume Manager, Btrfs, snapshots, quota, snapper.
2. Software management: RPM, external repositories, creating RPM packages, BSD ports, OpenPKG, AppImage.
3. Backup and recovery: tools: rsync, unison, tar, dd, xar, xdelta, rsnapshot, rdiff-backup, Csync, data compression tools, BackupPC, Borg.
4. Distributed file system NFS: fault tolerance, data consistency, automounter, access authorization, caching, NFSv4.
5. Samba package: Unix and Windows systems integration, distributed file system, domain controller, Winbind server, home directories, password synchronization, VFS modules.
6. Directory service LDAP: data input and retrieval, access rights, integration with the operating system,

security, replication.

Teaching methods

1. Lecture: multimedia presentation, discussion.
2. Laboratory: exercises carried out individually or in teams of 2-4 people depending on the nature of the exercise. The aim of the exercises is to set up, configure and test the presented mechanisms and services.

Bibliography

Basic
1. System documentation for file systems and services.

Additional
1. RFC documents describing standards of particular services and protocols.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00