COURSE DESCRIPTION CARD - SYLLABUS

Course name
Network management [S2EiT2E-TIT>ZS]

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/2

Area of study (specialization)
Information and Communication Technologies

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Janusz Kleban
janusz.kleban@put.poznan.pl

Lecturers

dr inż. Janusz Kleban
janusz.kleban@put.poznan.pl

Prerequisites

Student should be familiar with the terms related to telecommunication and computer networks, and should understand technical meaning of these terms. Should has in-depth knowledge of the architecture, construction, and operation of different kind of computer and telecommunication networks, as well as the structure and functionality of networking devices. Should be able to read and understand the professional books, and technical papers as well as to prepare and present a presentation related to solution of some selected networking problems.

Course objective

Familiarize students with the network management standards, terminology, and protocols. To present a survey of selected network management software and systems. Enhance in students the ability in selection of network and service management tools and to familiarise them with good practices in the network management area included in ITIL.

Course-related learning outcomes

Knowledge:
1. Has knowledge of the methods and standards related to the technical management of networks and

network services.
2. Has practical knowledge of software and protocols used in network management.
3. Knows and understands the technical meaning of the terms used in the network management area.
4. Has practical knowledge of the design and content of Service Level Agreements.

Skills:
1. Student is able to properly use the concepts of network management and interpret correctly the network management standards. Knows international standardization organizations.
2. Can make a choice and put into practice IT tools enabling management of networks and services.
3. Is able to ensure the continuity of offering IT infrastructure work and network services by ensuring the cooperation of specialists under the SLA.

Social competences:
1. Is aware of the necessity to approach solving technical problems with responsibility and professionalism.
3. Understands the dilemmas related to working in the field of network management. Is able to think and act in a businesslike way.
3. Can formulate own opinions on currently used and available solutions in the field of network and network services management.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

In terms of lectures: a written exam in the form of a multiple-choice test, containing at least 50 questions covering the issues discussed during the lectures. Questions may be scored differently depending on the number of correct answers. Exam passing threshold: more than 50% of points (dst grade). Grading scale according to the percentage division, i.e. more than 60% of points - dst plus, more than 70% of points - db, etc. As an support in preparation for the exam, students receive a set of slides presented during lectures and a set of issues.

In terms of tutorials: based on presentations prepared by students on the topic indicated by the teacher (the form and quality of the prepared materials are assessed) and the final test, as the arithmetic average of two grades. Final test in the form of a multiple-choice test, containing at least 20 questions covering the issues discussed during the tutorials. Questions may be scored differently depending on the number of correct answers. Test passing threshold: more than 50% of points (dst grade). Grading scale in accordance with the percentage division, i.e. more than 60% of points - dst plus, more than 70% of points - db, etc.

Laboratory: on the basis of at least three short (approx. 10 minutes) tests in the form of multiple-choice tests, final colloquium and reports. Passing threshold: more than 50% of the points scored in all tests. It is also required to pass reports from all exercises. The final test must be written by students who have not obtained enough points to pass the subject, or students who want to improve the proposed grade. Due to the fact that the tests are adapted to the current knowledge of students, it is not possible to correct the tests at later dates. In case of lack of a sufficient number of points, the final test allows obtain a pass. Students are required to complete all laboratory exercises. Passing is done by the teacher by checking the correctness of the exercise, e.g. by checking the correctness of network devices configuration and asking questions about the exercise being carried out. Failure to pass the exercise results in the necessity to repeat it on the date indicated by the teacher. Each student is required to upload a report on each exercise to the eKursy platform. Reports are subject to credit. Failure to pass even one report makes it impossible to obtain a credit for the course. Re-uploading the rejected report to the system, without making any corrections indicated by the teacher, will result in a reduction of the pool of points obtained by 3 points. Each report uploaded to the system after the date specified by the teacher will reduce the pool of points by 3 points.

Programme content

The course covers the following issues: standardization in network and service management, functional management areas, management based on the OSI model, manager-agent model, application layer of the management system, TMN, SLA agreements, ITIL, tools used in network management, protocols: SNMP , NetFlow, IPFix, selected management systems, MIBBrowser, BER, network controller.

Course topics

Within the lectures, students will learn the following topics:
1. Discussion of organizational issues related to the course: form of classes, program of the course, credit rules and literature. Introduction to network management. The concept of network management and functional areas of management. Standardization in the area of network and service management.
2. Management based on the OSI model. Primitives and parameters. Layer management, layer operations, systems management. The SMAP process and its components.
3. Manager - agent model. Relations between the manager and the agent. Manager and agent functions. Agent construction. Definition of managed objects. MIB database. MIT tree.
4. Application layer of management system. Service elements. Management information model. A notation for the object definition. ASN.1 notation. Systems management functions. TMN.
5. Management of network services: General characteristics of the SLA (Service Level Agreement). Service parameters included in SLAs. Methods for controlling parameters defined in SLAs.
6. Tools used in network management: management platforms, management systems, network analyzers, TTS systems (Trouble Ticketing Systems). General characteristics of ITIL (Information Technology Infrastructure Library). Rules for ensuring continuity of offering IT services in accordance with ITIL principles.

Within the exercises, students will learn the following issues:
1. SNMP and RMON protocols - construction, operation, parameters, applications.
2. Rules for ASN.1 notation and BER coding.
3. NetFlow and IPFix protocols - construction, operation, parameters, applications.
4. DMTF (Distributed Management Task Force) - scope of activities and recommendations.
5. Management systems: Zabbix, Zenoss, Nagios, OpenNMS and others.
6. Service life cycle, incident and problem management (ITIL).

The laboratories cover the following issues:
1. Overview of laboratory exercises.
2. SNMP functionality analysis and MIB database management.
3. NetFlow protocol operation analysis - CISCO Packet Tracer.
4. Using the ManageEngine MibBrowser application to retrieve parameter values stored in the MIB database of CISCO devices.
5. Decoding SNMP messages encoded in accordance with BER.
6. Network controller functionality.
7. Preparation of the SLA agreement.

Teaching methods

ctures: multimedia presentation; additional examples are given on the board.
Exercises: as part of the exercises, students prepare presentations on selected, practical topics, which are then presented and discussed as part of the class; preparing a presentation requires independent work, e.g. student should test the network management application and checks the scope of its functionality.
Laboratories: the introduction to selected exercises is carried out by means of a multimedia presentation. Each of the exercise has an instruction according to which students carry out consecutive steps of individual exercise. The instructions also contain additional questions about the studied issues.

Bibliography

Basic
1. J. Kleban, Slides for lectures in the course: Network Management
2. W. Stallings, Protokoły SNMP i RMON. Vademecum profesjonalisty, Helion, Gliwice, 2003
3. A. Clemm, Network Management Fundamentals, Cisco Press, 2006
4. ITIL Incident Management, https://www.invensislearning.com/resources/itil/what-is-incident-management
5. ITIL Problem Management, https://www.invensislearning.com/resources/itil/overview-of-problem-and-event-management
5. Service Desk in ITIL, https://www.invensislearning.com/resources/itil/what-is-service-desk-in-itil
6. Service Level Agreement, https://www.bmc.com/blogs/sla-template-examples/

Additional
1. U. Black, Network Management Standards, SNMP, CMIP, TMN, MIBs, and Object Libraries, McGraw-

Hill, 1995
2. J. Larmouth, ASN.1 Complete, Morgan Kaufmann, San Francisco, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,00
Classes requiring direct contact with the teacher	55	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	35	1,00