POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Management of telecommunications networks and services

Course

Field of study	Year/Semester
Electronics and Telecommunications	I/I
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	
15		

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr inż. Janusz Kleban

janusz.kleban@put.poznan.pl

Responsible for the course/lecturer:

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.

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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 answers to 10-15 open questions (variously scored 1 or 2 points) covering issues discussed during lectures. Exam pass threshold: 50% of points (dst grade). The scale of grades is in line with the percentage distribution, i.e. from 60% of points - dst plus, 70% of points - db, etc. As a help in preparing for the exam, students receive a set of slides presented during lectures.

In the field of laboratories: based on at least three short (approx. 15 min) entrance tests carried out before the start of the laboratory. The tests include at least two open questions (scored -1 or 2 points) regarding the knowledge required to perform the planned exercise. Passing threshold: 50% of points

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gained from all entrance tests. In addition, students are required to pass all laboratory exercises. Credit is given by the teacher by checking the correctness of the exercise, e.g. by assessing the results obtained and asking questions about the exercise being carried out. Lack of passing the exercise results in the need to repeat it within the date indicated by the teacher.

In terms of exercises: based on presentations prepared by students on a topic indicated by the lecturer (the form and quality of the prepared materials is assessed) and the final test. The final grade is arithmetic average of two grades. Final test in the form of answers to 5 open questions scoring 2 or 3 points. Colloquium assessment threshold: 50% of points (dst grade). The scale of grades is in line with the percentage distribution, i.e. from 60% of points - dst plus, 70% of points - db, etc.

Programme content

Lectures cover 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.

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6. Service life cycle, incident and problem management (ITIL).

The laboratory exercises cover the following issues:

1. Overview of laboratory exercises. Analyzing the MIB database structure and its content using the MibBrowser application.

2. Management of MIB database using operating system command line commands.

3. Interception of SNMP messages using WireShark and its decoding.

4. Observing value of parameters stored in the MIB of CISCO devices - routers, switches. Completing the exercise requires configuration of the network on CISCO routers.

5. Preparation of the SLA.

Teaching methods

Lectures: 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/

POZNAN UNIVERSITY OF TECHNOLOGY

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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	3,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1

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[1] delete or add other activities as appropriate