COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computer network technologies [S1EiT1>TSK]

Course

Field of study
Electronics and Telecommunications

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Students starting this course should have a basic knowledge of the structure and operation of computers and should know the binary and decimal systems. They should have the ability to convert decimal numbers to binary and vice versa, be able to obtain knowledge from indicated sources and be ready to cooperate within the team.

Course objective

Provide students with basic knowledge of computer networks necessary for further study of more advanced issues. To acquaint students with selected concepts and network technologies, in particular with hardware solutions, for the proper building and configuration of computer networks. Developing students" skills in solving problems arising in the process of network devices parameters configuration.

Course-related learning outcomes

Knowledge:
1. Knows the terms characterizing computer networks and understands the technical meaning of these terms.
2. Has basic knowledge of standards, architecture, network protocols and operation of computer

networks.
3. Has knowledge of the operation, configuration and application of basic devices used in computer networks.
4. Has a systematic and well-founded knowledge of the directions of development of network techniques.

Skills:
1. Is able to configure network devices and hosts and run local computer network.
2. Is able to configure WAN routing. Can use selected applications that analyze network traffic.
3. Is able to correctly use the concepts of computer networks.
4. Is able to further independently educate in the field of computer networks.

Social competences:
1. Is aware of the impact ICT systems and networks will have on the development of the information society.
2. Is aware of the need for a professional approach solving technical problems and taking responsibility for the proposed technical solutions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: written exam in the form of a multiple-choice test, containing at least 70 questions covering the issues discussed during the lectures. Questions can be scored differently depending on the number of correct answers. Exam completion threshold: 50% of points (dst grade). The grading scale complies with the percentage division, i.e. from 60% of points - dst plus grade, 70% of points - db grade, etc. As a help in preparing for the exam, students receive a set of slides presented during lectures and a set of issues facilitating preparation for the exam.
Laboratory: on the basis of at least seven short (approx. 10 min.) tests, final test and reports. Passing threshold: 50% of the points obtained from all tests. It is also required to pass the 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

Lectures cover the following topics:
1. Overview of organizational issues related to the course: form of classes, program of the course, credit rules and literature. Introduction to computer networks. Tasks performed by computer networks. The development of computer networks and network mechanisms from the sixties of the last century to the present day.
2. Packet switched networks - introductory issues. General computer network architecture, classification of computer networks. Types of switching techniques and control. Network topologies. Mechanisms of control and route selection in networks with packet switching.
3. Layer models. Characteristics of the OSI, SNA and TCP / IP models. Functions of each layer. Importance of layered models in practice.
4. Local area networks. IEEE802 model. Local network topologies. Functional characteristics of LLC and MAC sublayers. Operation of the LLC sublayer. Overview of protocols used in the MAC sublayer.
5. The development and application of the Ethernet standard. Ethernet concept. Characteristics of 10 Mb / s, 100 Mb / s, 1 Gb / s, 10 Gb / s, 40 Gb / s and 100 Gb / s standards. Ethernet in telecom operator networks.
6. Structured cabling. Structured cabling standards, cabling elements, rules for building structured cabling.

Transmission media: twisted pair, optical fiber.
7. Network equipment. Construction and operation of hubs, bridges, switches and routers. STP protocol. Link aggregation. Applications of routers in local area networks. UTM devices. Construction and operation of high-end routers. Types of switching networks and control algorithms for high-end routers.
8. TCP/IP protocol suite. Functions of IP, TCP and UDP protocols. Structure of packets generated by each protocol. Network addressing.
9. Routing protocols. Static and dynamic routing. Classification of routing protocols. General characteristics of selected routing protocols.
10. WLAN, VLAN and VPN networks. Configuring VLANs. WLAN hardware and protocols. VPN protocols.
11. General characteristics of DiffServ, IntServ, IMS. Prospects for the development of the Internet. Discussion of the assumptions of the Future Internet with particular emphasis on the Internet of Things. Architecture of the Future Internet. SDN networks.

Laboratory exercises cover the following topics:
1. Laboratory classes overview. Basics of IP addressing. Solving practical tasks related to IP addressing.
2. Network tools available in the operating system. Network analyzers - observation of traffic in the local network. Analysis of the operation of a local computer network. The role of the ARP table and the default gateway. DNS operation.
3. Getting to know the IOS system, commands for configuring the routers, configuring the routers and checking the correctness of the configuration.
4. IP addressing planning and configuring the routers according to the planned addressing.
5. Basics of routing. RIP protocol and routing table. Configuring routers, checking RIP parameters.
6. Creating subnets with a variable-lengts mask. Configuring the routers according to the prepared addressing. Validating the operation of the proposed configuration.
7. RIPv2 protocol. Protocol operation, routing table, protocol parameters.
8. Static routing. Planning of addressing for the selected network. Implementing static routing on routers. Checking the operation of the network.
9. Functions of switches in LAN networks (CAM table creation, STP protocol, VLAN network building).
10. Repeating exercises that were not passed.

Teaching methods

Lectures: multimedia presentation; additional examples are provided on the board.
Laboratory exercises: introduction to selected exercises is carried out by means of a multimedia presentation and examples provided on the blackboard. Each of the exercise has an instruction, according to which students carry out individual exercises. The instructions also contain additional questions related to the study topics.

Bibliography

Basic
1. J.F. Kurose, K.W. Ross: Sieci komputerowe. Ujęcie całościowe, Wydanie VII, Helion, Gliwice, 2017
2. A.S. Tannenbaum, D.J. Wetherall: Sieci komputerowe, Helion, Gliwice, 2012
Additional
1. K. Nowicki, J. Woźniak: Sieci LAN, MAN i WAN - protokoły komunikacyjne, Wydawnictwo Fundacji Postępu Telekomunikacji, Kraków, 2001
2. R. Pawlak, Okablowanie strukturalne sieci. Teoria i praktyka, Wydanie III, Helion, Gliwice, 2011.
3. Akademia sieci Cisco: Cisco Systems, INC.: autoryzowany podręcznik programu Cisco Networking Academy, red. Vito Amato; współpr. Wayne Lewis ; przekł. z jęz. ang. Wiesława Jachymczyk, Krzysztof Turczyński.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00