COURSE DESCRIPTION CARD - SYLLABUS

Course name
Communication protocols and computer networks

Course

Field of study
Electronics and Telecommunications
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
III/V
Profile of study
general academic
Course offered in
Polish
Requirements
elective

Number of hours

Lecture
30
Laboratory classes
30
Other (e.g. online)
Tutorials
Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
dr hab. inż. Sławomir Hanczewski

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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 in the field of computer networks with particular emphasis on communication protocols. To acquaint students with the structure, operation and standards of computer networks, as well as with selected communication protocols supporting the implementation of various network services. 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:

In the field of laboratory exercises: on the basis of at least six short (approx. 10 min.) entrance tests conducted before the beginning of the laboratory classes. Tests include open questions and tasks that require calculations related to IP addresses, such as dividing the network into subnets with a variable-length subnet mask. Passing threshold: 50% of the points obtained from all entrance tests. In addition, students are required to complete all laboratory exercises. Assessment of laboratory exercises execution is made by the teacher 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.

In terms of lectures: written exam in the form of answers to 10-15 open questions (variously scored - 1 or 2 points) covering the issues discussed during the lectures. Exam completion threshold: 50% of points (dst grade). The grading scale complies with the percentage division, ie from 60% of points - dst plus grade, 70% of points - db grade, etc. Students are provided with a set of slides presented during lectures.

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. Development of the Internet and network services.

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. Structured cabling. Structured cabling standards, cabling elements, rules for building structured cabling. Transmission media: twisted pair, optical fiber.

6. Network equipment. Construction and operation of hubs, bridges, switches and routers. STP protocol. Link aggregation. Applications of routers in local area networks. UTM devices.

7. TCP/IP protocol suite. Functions of IP, TCP and UDP protocols. Analysis of the content of packet headers for each protocol.

8. Network mechanisms implemented in protocols: IP: segmentation of a datagram into smaller datagrams, options; TCP: flow control, TCP windows. Network addressing. DHCP. NAT. Development of the Internet and network services.

9. Routing protocols. Static and dynamic routing. Classification of routing protocols. Presentation of RIP, OSPF, IGRP, EIGRP and BGP protocols.

10. Discussion of selected application layer protocols. WWW service and HTTP protocol. E-mail. DNS system. SNMP protocol. FTP protocol.

11. Internet development prospect. Discussion of the assumptions of the Future Internet with particular emphasis on the Internet of Things. Architecture of the Future Internet. SDN networks and the OpenFlow protocol.

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. Basics of routing. RIP protocol and routing table. Configuring routers, checking RIP parameters.

5. Subnetting with a variable-lengts mask. Planning IP addresses using a variable-length mask.

6. Configuration of the routers according to the addressing prepared for the laboratory network. 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. DHCP protocol. Configuration of protocol parameters.

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	4,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate