COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computer Networks

Course

Field of study
Electronics and Telecomunnications

Year/Semester
2/4

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
english

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)

Tutorials
0

Projects/seminars
-/-

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
dr. Maciej Sobieraj
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Prerequisites

The student starting the subject should have a basic knowledge of the construction and operation of computers and signal transmission. They should also be able to obtain information from indicated sources and be willing to cooperate as part of a team.

Course objective

To provide students with basic knowledge about the methods, technologies and protocols necessary to understand the operation of computer networks. Developing students' ability to analyze and detect anomalies in the operation of basic computer network protocols.

Course-related learning outcomes

Knowledge

1. has basic knowledge of the operation of protocols ensuring network communication

2. has knowledge of issues of security of data transmission in computer networks

3. has knowledge of technologies that ensure communication in computer networksh

Skills

1. is able to analyze the operation of protocols used in computer networks

2. can detect errors in the operation of protocols used in computer networks

Social competences

The student understands that knowledge and skills regarding the protocols and technologies used in computer networks are constantly changing.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The exam takes the form of a written and / or oral exam depending on the size of the group.

The exam consists of answers to at least 10 questions drawn individually by each student from a set of 45 issues known to students (passed on during the lecture). An urn with a number of tickets equal to the number of issues is used for the draw. After the draw, the fate is returned to the ballot box.

The answer to the question takes into account the extent of the answer and the depth of understanding of the issue by the student. Each answer to a given question is graded on a scale of 2 to 5. The final grade of the oral exam is the average of the scores for individual answers. The exam is passed when the average rating is higher than 2.75.

Programme content

The topics of the lecture include the following issues:

1. Computer Networks and the Internet: m.in. Delay, Loss, and Throughput in Packet-Switched Networks, Throughput in Computer Networks, Encapsulation.

2. Application Layer: m.in. Processes Communicating, Transport Services Available to Applications, The Web and HTTP, Electronic Mail in the Internet, DNS–The Internet's Directory Service, Peer-to-Peer Applications.

3. Transport Layer: m.in. Relationship Between Transport and Network Layers, Multiplexing and Demultiplexing, Building a Reliable Data Transfer Protocol, Go-Back-N (GBN), Selective Repeat (SR), Connection-Oriented Transport: TCP, RTT, Reliable Data Transfer, Flow Control, TCP Congestion Control.

4. The Network Layer: m.in.Forwarding and Routing, Virtual-Circuit Networks, Datagram Networks, Switching, Where Does Queuing Occur?, The Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing.

5. The Link Layer: Links, Access Networks, and LANs: m.in. The Services Provided by the Link Layer, Multiple Access Links and Protocols, DOCSIS: The Link-Layer Protocol for Cable Internet Access, Switched Local Area Networks. ARP, Ethernet, VLANs, Link Virtualization: A Network as a Link Layer, MPLS.

6. Wireless and Mobile Networks: m.in. CDMA, WiFi: 802.11 Wireless LANs, Personal Area Networks: Bluetooth and Zipbee, Cellular Internet Access, Mobile IP.

7. Multimedia Networking: m.in. Multimedia Networking Applications, Properties of Video and Audio, Streaming, Content Distribution Networks, VoIP, Diffserv.

8. Security in Computer Networks: m.in Principles of Cryptography, Symmetric Key Cryptography, Public Key Encryption, Digital Signatures, PGP, Securing TCP Connections: SSL, Network-Layer Security: IPsec and Virtual Private Networks, IPsec and Virtual Private Networks (VPNs), Securing Wireless LANs, 8.9 Operational Security: Firewalls and Intrusion Detection Systems.

9. Network Management: e.g. The Infrastructure for Network Management, The Internet-Standard Management Framework, ASN.1.

The following issues are discussed during the laboratories:

1. The use of freeware tools for the analysis and testing of computer networks.

2. Analysis of the operation of application layer protocols on the example of HTTP and SSL.

3. Ensuring reliable communication - IP and TCP protocol.

4. Protocols supporting address management (DNS, NAT, ARP).

Teaching methods

Depending on the topic discussed and the students' interest, the lecture is conducted in one of three forms: traditional lecture, problem lecture or conversational lecture.

Laboratory exercises: exercises conducted by tutors in the laboratory of the Huawei ICT Academy. During the course, students learn about the basic tools for analyzing and testing computer networks. Then they use them to analyze the operation of basic network protocols, i.e. HTTP, DNS, TCP, UDP, IP, NAT, ICMP, ARP, DHCP and SSL.

Bibliography

Basic

James F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach, 7/E, Pearson, 2017

Additional

1. Douglas E. Comer: Computer Networks and Internets, 6/E, Pearson, 2015

2. Andrew S. Tanenbaum, David J. Wetherall: Computer Networks, 5/E, Pearson, 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes, preparation for exam) [1]	55	2

[1] delete or add other activities as appropriate