COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of local area networks [S1Cybez1>PLSK]

Course

Field of study
Cybersecurity

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr hab. inż. Piotr Zwierzykowski prof. PP
piotr.zwierzykowski@put.poznan.pl

Lecturers

Prerequisites

A student starting this course should have basic knowledge of telecommunication networks. They should also understand the necessity of expanding their competencies. Additionally, in terms of social competencies, the student must demonstrate attitudes such as honesty, responsibility, perseverance, intellectual curiosity, creativity, personal culture, and respect for others.

Course objective

The objectives of the course are: • Deepening knowledge in the field of local area networks (LAN). • Developing skills in designing, configuring, and diagnosing LAN networks. • Introducing mechanisms for traffic protection and segmentation in local networks. • Preparing students for further learning and work in a networked environment.

Course-related learning outcomes

Knowledge:
• The student knows the basics of the operation and architecture of local area networks (LAN). [K1_W07]
• Understands the mechanisms and protocols used in LAN networks. [K1_W11]

• Knows the methods of network traffic segmentation and security in LAN. [K1_W07]

Skills:
• Able to design and configure a local area network (LAN) with VLAN and trunking. [K1_U02]
• Capable of diagnosing network issues using analytical tools. [K1_U04]
• Able to implement basic security mechanisms in LAN networks. [K1_U06]

Social competences:
• Understands the importance of continuous skill improvement in the dynamically evolving field of computer networks. [K1_K01]
• Able to work in a team on projects related to network design and management. [K1_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

• Knowledge: A written test assessing the understanding of protocols, mechanisms, and LAN configuration.
• Skills: Ongoing evaluation of laboratory exercises and team projects.
In each form of the course assessment, the grade depends on the number of points the student earns relative to the maximum number of required points. Earning at least 50% of the possible points is a prerequisite for passing. The relationship between the grade and the number of points is defined by the Study Regulations. Additionally, the course completion rules and the exact passing thresholds will be communicated to students at the beginning of the semester through the university's electronic systems and during the first class meeting (in each form of classes).

Programme content

The course "Fundamentals of Local Area Networks" develops practical skills and technical knowledge in the field of LAN networks, serving as a key component in the education of IT and cybersecurity specialists.

Course topics

I. Architecture of Local Area Networks (LAN)
1. Network Topologies
- Physical and logical topologies.
- Scalability and limitations in LAN design.
- Data Link Layer Protocols
- Overview of network devices and transmission media.
- Standards: detailed IEEE 802.3 (Ethernet) and general IEEE 802.11 (Wi-Fi).
II. LAN Configuration and Management
1. Basic Configuration of Switches and Routers
- VLAN: network segmentation and traffic isolation.
- Trunk configuration (802.1Q).
- Dynamic Host Configuration Protocol (DHCP).
2. Network Layer Protocols
- Routing in local networks: static and dynamic protocols.
- ARP (Address Resolution Protocol) and ICMP (Internet Control Message Protocol).
3. LAN Diagnostics and Monitoring
- Diagnostic tools: ping, traceroute, Wireshark.
- Basics of network monitoring using SNMP.
III. Security in Local Area Networks
1. LAN Protection Mechanisms
- Access control at the data link layer: port security.
- Traffic filtering based on MAC addresses.
- Detection and prevention of LAN attacks (e.g., ARP spoofing).
2. Access Management and Security Policies
- Implementation of ACL (Access Control Lists).
- Segmentation and isolation of sensitive traffic.
IV. Practical Aspects: Laboratory Exercises

1. LAN Design and Configuration
- Creating and configuring VLANs and trunk connections.
- Configuring basic network services (DHCP, DNS).
2. Network Diagnostics and Troubleshooting
- Network traffic analysis using Wireshark.
- Troubleshooting addressing and routing issues.
3. LAN Security in Practice
- Implementing port security mechanisms.
- Configuring ACLs in a network environment.

Teaching methods

• Lectures with practical elements and case studies.
• Laboratory sessions including exercises on network configuration and analysis.

Bibliography

Basic:
1. "Computer Networking: Principles, Protocols, and Practice" - Olivier Bonaventure.
2. "CCNA Routing and Switching Study Guide" - Todd Lammle.
3. Dokumentacja standardów IEEE 802.3 i 802.11.
4. Materiały dydaktyczne przygotowane przez prowadzących

Additional:
-

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,00