**SYLLABUS**

**regarding the qualification cycle FROM 2023 TO 2024**

1.Basic Course/Module Information

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| Course/Module title | *Networking Technologies* |
| Course/Module code \* |  |
| Faculty (name of the unit offering the field of study) | *College of Natural Sciences* |
| Name of the unit running the course | ***Institute of Computer Science*** |
| Field of study | *Computer Science & Computer Science and Econometrics* |
| Qualification level | *First degree* |
| Profile | *Academic* |
| Study mode | *Full-time* |
| Year and semester of studies | *Year 2, semester 4* |
| Course type | *Major engineering* |
| Language of instruction | *English* |
| Coordinator | *mgr inż. Jarosław Szkoła* |
| Course instructor | *mgr inż. Jarosław Szkoła* |

\* - as agreed at the faculty

1.1. Learning format – number of hours and ECTS credits

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Semester  (n0.) | Lectures | Classes | Colloquia | Lab classes | Seminars | Practical classes | Internships | others | **ECTS credits** |
| 4 |  |  |  | 30 |  |  |  |  | 4 |

1.2. Course delivery methods

- conducted in a traditional way

- involving distance education methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)

pass with a grade

2.Prerequisites

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| No requirements |

3.Objectives, Learning Outcomes, Course Content, and Instructional Methods

3.1.Course/Module objectives

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| O1 | Using the correct terminology in the field of computer networks |
| O2 | Understanding the technologies of wired and wireless local networks, as well as the mechanisms of their operation |
| O3 | Getting to know the mechanisms of operation of TCP and UDP network protocols |
| O4 | Getting to know the rules of routing, getting to know the principles of operation and the importance of the DNS system |
| O5 | Knowledge of LAN and Internet consolidation technologies |
| O6 | Knowledge of network traffic safety issues |
| O7 | Acquiring the ability to configure and design computer networks |

3.2.Course/Module Learning Outcomes (to be completed by the coordinator)

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| --- | --- | --- |
| Learning Outcome | The description of the learning outcome  defined for the course/module | Relation to the degree programme outcomes |
| LO\_01 | Can indicate the type of communication protocol for selected network services at a basic level, can choose an appropriate network addressing model for selected network services at a basic level, can indicate an appropriate model of routing for a given network specification | K\_W03 |
| LO\_02 | Can indicate the type of communication protocol for selected network services at an advanced level, can choose the appropriate model of network addressing for selected network services at an advanced level, can indicate the appropriate model and routing protocol for a given network specification | K\_W04 |
| LO\_03 | Can configure simple computer networks. Can solve problems in the already existing simple computer networks. | K\_W07 |
| LO\_04 | Can identify threats related to the functioning of computer networks,  Can indicate the basic methods of securing computer networks. | K\_W08 |
| LO\_05 | Can configure a computer network with the use of hardware and software solutions for the given specification. | K\_U11 |
| LO\_06 | Can configure the network, ensuring an appropriate level of security | K\_U13 |

**3.3. Course content (to be completed by the coordinator)**

1. Lectures

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| Content outline |
| History of computer networks. Network models. Types and topologies of networks |
| Transmission media. Network devices. The development of the Ethernet standard. Development of wireless networks |
| Characteristics of individual layers of the ISO-OSI model and principles of network and inter-network communication. Comparison of TCP and UDP. Comparison of the ISO-OSI model with the TCP / IP model |
| Addressing in IP networks. Types of IPv4 addresses. IP v4 addressing techniques. Elements of the IP v6 protocol theory |
| Data link layer, network and transport layer protocols. Application layer protocols |
| Switches - role in network communication, architecture, principles of operation, technical parameters |
| Routers - the role in network communication, architecture, principles of operation, technical parameters |
| Routing in IP networks. Static Routing. Dynamic routing protocols. Principles of route selection. Routing table |
| VLAN technology - an overview of the different implementation methods |
| WLAN wireless networks |
| Basic network services: DNS, SSH, HTTP, FTP, e-mail and more |
| Online data protection: threats, security procedures, design, tools, traffic analysis |
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1. Classes, tutorials/seminars, colloquia, laboratories, practical classes

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| Content outline |
| Models of computer networks. Functionality and protocols of the network and transport layer. Passive and active network elements |
| Standards of the Ethernet network, rules for selecting the appropriate communication medium (twisted pair cable, optical fiber, wireless network) |
| Examples of applications and the meaning of the UDP protocol |
| MAC and IPv4 addressing. ARP protocol. Ways of getting an IP address |
| Basic network commands for selected operating systems |
| Building a LAN network with the use of various media and devices. Solving problems |
| Configuration of basic router parameters |
| Static Routing. Definition of administrative distance and route cost |
| Dynamic routing. RIP version 1. RIP version 2 |
| Dynamic routing. OSPF protocol |
| Collecting data about the network using the SNMP protocol |
| Configuration of virtual networks - VLAN. Trunking |
| Routing between virtual networks |
| Analysis of network packets using Wireshark, threat detection, detailed analysis of generated traffic for selected services |
| Setting up a wireless access point |

3.4. Methods of Instruction

Lecture: problem lecture, lecture with multimedia presentation

Laboratory: experiments, project, distance learning methods

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

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| Learning outcome | Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes) | Learning format (lectures, classes,…) |
| LO-01 | Written exam | Lectures |
| LO-o2 | written exam | Lectures |
| LO-o3 | written exam | Lectures |
| LO-o4 | written exam | Lectures |
| LO-o5 | Reports from individual classes + project | Classes |
| LO-o6 | Reports from individual classes + project | Classes |

4.2 Course assessment criteria

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| For a satisfactory grade (3.0):   * The student participates in the classes, * received positive evaluations from the reports, * knows the models of computer networks, * knows the principles of operation of active devices, * can describe popular network solutions.   For a good grade (4.0):  The student meets the satisfactory assessment criterion, and moreover:   * actively participates in classes, * has obtained an average grade on the reports and the project higher than 3.5, * can describe the role of all layers of the OSI model and the protocols that occur in them, * can assess the advantages and disadvantages of modern network technologies and list the types of threats and ways to prevent them.   Very good grade (5.0):  The student meets the good assessment criterion, and in addition:   * has obtained an average grade from reports and project of at least 4.5, * they can formulate and justify their own opinions on the directions of development, the future and problems of computer network security. |

5. Total student workload needed to achieve the intended learning outcomes

– number of hours and ECTS credits

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| --- | --- |
| Activity | Number of hours |
| Scheduled course contact hours | 30 |
| Other contact hours involving the teacher (consultation hours, examinations) |  |
| Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.) | 70 |
| Total number of hours | 100 |
| Total number of ECTS credits | 4 |

\* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

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| --- | --- |
| Number of hours | *-* |
| Internship regulations and procedures | *-* |

7. Instructional materials

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| Compulsory literature:   1. https://alison.com/courses/it/computer-networking (free) 2. https://www.coursera.org/learn/computer-networking (google - free) 3. An Introduction to Computer Networks - Second Edition, (Peter Lars Dordal, Loyola University Of Chicago - Last Update: 2020) 4. Computer networks (5th edition) by Andrew S. Tanenbaum, David J. Wetherall (960 pages, published 2010) 5. Website with documentation and software from Mikrotik website: https://mikrotik.com/ |
| Complementary literature:   1. https://itmasters.edu.au/free-short-course-cisco-ccna-security/ 2. https://www.edx.org/course/introduction-to-open-source-networking-technologie 3. https://www.coursera.org/specializations/networking-google-cloud-platform |

Approved by the Head of the Department or an authorised person