



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Computer networks [S1Bioinf1>SK]

Course

Field of study

Bioinformatics

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

0

Tutorials

0

Projects/seminars

0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Student starting this module should have basic knowledge regarding computer systems organization, algorithms and data structures, and operating systems. Skills: He/she should have skills allowing formulation of algorithms and their programming with the use of at least one widely used software tool. He/she should have skills that are necessary to acquire information from given sources of information. Student should understand the need to extend his/her competences and should express cooperativeness in a team. Social competencies: In addition, in respect to the social skills the student should show attitudes as honesty, responsibility, perseverance, curiosity, creativity, manners, and respect for other people.

Course objective

1. Provide students' knowledge regarding computer networks, within the scope of using, configuration, design and programming of local area and wide area networks, and cognition of technical solutions applied in these networks. 2. Develop students' skills in solving simple problems related to the use and configuration of computer networks. 3. Develop students' skills in team work, especially in configuration, design, and programming of technical solutions applied in computer networks.

Course-related learning outcomes

Knowledge:

1. knows the selected topics considering networking technologies - [K1_W10]
2. has the basic knowledge dealing with life cycle of computing systems - [K1_W12]

Skills:

1. designs and creates computer software according to given specification, using appropriate methods, technics and tools - [K1_U07]
2. is able to prepare, in Polish or English, well documented report and oral presentation dealing with topics from the area of computer networks - [K1_U09]
3. is able to perform the functionality analysis and requirements analysis of computing systems - [K1_U12]

Social competences:

1. understands the need of self-learning all the life and improving the competences - [K1_K01]
2. is able to cooperate and work in a team, accepting various roles - [K1_K02]
3. is able to define the priorities used for the implementation of the task defined by himself or others - [K1_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Formative assessment:

a) lectures:

based on answers to questions on previous lectures,

b) laboratory classes:

evaluation of doing correctly assigned tasks,

Total assessment:

a) In terms of lectures

- assessment of knowledge and skills in the form of test.

b) In the field of laboratories in the form of:

- assessment of knowledge and skills acquired in the laboratory through a final test, and small tests on each laboratory

Programme content

The lecture should cover the following topics

- 1) Fundamentals of computer networks (historical note, motivation, required properties of a network, network architecture: OSI and TCP/IP, network topologies, network types, network devices, standards).
- 2) Network access technologies (functions of network interface card: encoding, framing, error detection, reliable transmission, link access methods), local area networks (CSMA/CD - Ethernet, CSMA/CA - wireless networks).
- 3) Delivery, forwarding and routing (packet switching, forwarding, routing, routing algorithms, RIP and OSPF protocols, cell switching - ATM, switching devices).
- 4) Internetworking (IPv4 protocol, IPv6 protocol, multicast, domain name system - DNS).
- 5) Communication protocols (creation, objective, standards, protocol engineering)
- 6) Internet (structure, addressing, transport protocols: UDP, TCP, standards, applications).
- 7) Modern technologies of computer networks

The lab-classes should cover the following topics:

- 1) Network Tools
- 2) Physical Layer and Structured Cabling Elements
- 3) Data Link Layer, Switches
- 4) Network Layer, Routing Basics
- 5) Tools for Diagnostics and Testing Layers 4-7
- 6) Virtual Local Area Networks
- 7) Router Configuration
- 8) Dynamic Routing

- 9) Packet Filtering
- 10) Address Translation
- 11) DHCP and SLAAC, DNS Querying
- 12) Wireless Networks

Course topics

As part of the lecture component, students gain comprehensive theoretical knowledge about the structure and functioning of modern computer networks. The course begins with foundational topics such as the historical development of networks, basic terminology, topologies, and network architecture models including OSI and TCP/IP. It then progresses to more advanced issues such as the operation of network interface cards, both wired and wireless local area networks (e.g., Ethernet with CSMA/CD and wireless networks with CSMA/CA), as well as packet switching, routing principles, and protocols like RIP and OSPF. Students also explore how heterogeneous networks interoperate, learn about the structure and purpose of communication protocols, and study address management mechanisms, including IPv4, IPv6, DNS, and multicast communication. The lecture series concludes with an overview of modern networking technologies and protocol engineering principles.

The laboratory classes provide students with hands-on experience and practical skills related to configuring and diagnosing network components across different layers of the network model. Students work with essential network tools, understand the physical layer and structured cabling, and learn to configure switches and routers. The labs also cover topics such as basic and dynamic routing, virtual LANs, packet filtering, network address translation (NAT), and service configuration including DHCP, SLAAC, and DNS queries. Additionally, students analyze and test network behavior using tools that operate across layers 4 to 7 of the OSI model. Wireless networking is also addressed, providing students with practical insights into building and maintaining both wired and wireless network environments.

Teaching methods

Lectures: multimedia presentation, presentation illustrated with examples presented on blackboard.

Labs: solving tasks, practical exercises with use of network devices, discussion, teamwork, multimedia showcase, configuration task.

Bibliography

Basic

1. TCP/IP Protocol Suite, 4th edition, B.A. Forouzan, McGraw-Hill Education, New York, 2009
2. Computer Networks, 5th edition, A.S. Tanenbaum, D.J. Wetherall, Pearson, Boston, 2011
3. Computer Networking: A Top-Down Approach, 7th edition, J.F. Kurose, K.W. Ross, Pearson Education, Boston, 2016
4. Computer Networks: A Systems Approach, L.L. Peterson, B.S. Davie, 5th edition, Morgan Kaufmann, San Francisco, 2012

Additional

1. Network Analysis and Troubleshooting, J. Scott Haugdahl, Addison-Wesley, 1999

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50