# COURSE DESCRIPTION CARD - SYLLABUS

Course name

Network Programming

## Course

Field of study

Bioinformatics

Year/Semester

3/ 5

Area of study (specialization)

-

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

## Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

## Number of credit points

4

## Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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## 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 funcionality 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:

Formative assessment:

a) lectures:

based on answers to questions on previous lectures,

b) laboratory classes:

evaluation of doing correctly assigned tasks,

Total assessment:

a) verification of assumed learning objectives related to lectures:

i. based on the sum of answers and the activity during lectures.

ii. evaluation of student's knowledge and skills obtained in lectures based on written test, covering from 3 to 5 questions, or from 10 to 15 test questions. In order to obtain positive note, the student should obtain 50% of maximum number of points. During the test, student cannot use any lecture notes, books, etc.

b) verification of assumed learning objectives related to laboratory classes:

i. evaluation of student's skills related to carrying out the lab tasks and configuration task,

ii. monitoring student's continuing activities during classes,

iii. evaluation of student's skills based on one or two tests, covering from 10 to 15 questions,

iv. the final note of a student obtained during laboratory class is a weighted average from configuration task (1/2) and final test (1/2).

## 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) Internet (structure, addressing, IP protocol, transport protocols: UDP, TCP, standards).

3) Network programming - introduction.

4) Client-Server model and creation of software.

5) Programming interface for communication protocols.

6) Socket interface.

7) Algorithms and problems in implementation of client's software.

8) Algorithms and problems in implementation of servers.

9) Examples of client's programs and server's programs.

The lab-classes should cover the following topics:

1) IPv4 addressing

2) Configuration of Linux network

3) Layered ISO/OSI model and creation of packets

4) Lower layer protocols

5) Introduction to socket interface

6) Server model with the use of fork()

7) Server model with the use of threads

8) Server model in event models

9) Twisted library for creation of servers in Python

10) getevent library based on green threads in Python

11) Programming of servers in session layer

12) Network programming of services in a model of network messages queues

## 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 verified during laboratory classes.

## Bibliography

Basic

1. Unix - Network Services Programming. Networking APIs: Sockets and XTI, W.R. Stevens, Prentice-Hall 1998

2. TCP/IP Protocol Suite, 4th edition, B.A. Forouzan, McGraw-Hill Education, New York, 2009

3. Computer Networks, 5th edition, A.S. Tanenbaum, D.J. Wetherall, Pearson, Boston, 2011

4. Computer Networking: A Top-Down Approach, 7th edition, J.F. Kurose, K.W. Ross, Pearson Education, Boston, 2016

5. Computer Networks: A Systems Approach, L.L. Peterson, B.S. Davie, 5th edition, Morgan Kauffmann, 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 | 4,0 |
| Classes requiring direct contact with the teacher | 60 | 2,5 |
| Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, configuration task preparation) [1] | 40 | 1,5 |

[1] delete or add other activities as appropriate