



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Computer networks [S1AiR2>PO11-SK]

### Course

Field of study

Automatic Control and Robotics

Year/Semester

4/7

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

15

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3,00

### Coordinators

dr inż. Paweł Pawłowski

pawel.pawlowski@put.poznan.pl

### Lecturers

### Prerequisites

Knowledge: A student starting this subject should have basic knowledge of information technologies, computer science and electronics, microprocessor systems, materials science as well as signal and information processing. Skills: She or he should have the ability to solve basic problems in the design of information systems and the ability to obtain information from specified sources. She or he should also understand the need to expand her/his competences and be ready to cooperate in a team. Social competences: In addition, she or he should exhibit qualities such as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture and respect for other people.

### Course objective

1. Providing students with knowledge about the construction, design, use and administration of computer networks. 2. Developing students ability to solve problems in the implementation of elements of the computer network projects. 3. Developing students' teamwork skills in implementing projects.

### Course-related learning outcomes

Knowledge:

1. A student has ordered knowledge in computer networks including real-time networks - [K1\_W9]

2. A student is familiar with the current state and the latest development trends in the field of automation and robotics - [K1\_W21]
3. A student knows the basic components of modern computer networks and how to select them for selected applications - [-]

#### Skills:

1. A student is able to use information and communication techniques - [K1\_U8]
2. A student is able to assess the suitability of routine methods and tools for the design of automation and robotics systems, and choose and apply the right method and tools - [K1\_U24]
3. A student is able to design and implement a local teleinformation network (including an industrial network) by selecting and configuring communication elements and devices (wired and wireless) - [K1\_U28]

#### Social competences:

1. A student is ready to critically assess knowledge, understands the need and knows the possibilities of continuous training - raising professional, personal and social competences, she or he is able to inspire and organize the learning process of other people - [K1\_K1]
2. A student is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for the decisions taken - [K1\_K2]
3. A student is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which the devices and their elements can function, compliance with the principles of professional ethics and respect for the diversity of views and cultures - [K1\_K5]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

#### Formative assessment:

a) in the scope of lectures:

based on answers to questions about the material discussed in previous lectures

b) in the scope of laboratories:

based on an assessment of the current progress of task implementation.

#### Summative assessment:

a) in the scope of lectures: the verification of the assumed learning outcomes is carried out by:

- i. assessment of knowledge and skills demonstrated on the multiple-choice written test (20 test questions), 2 questions requiring supplementation of the content and a problem task; on the test the student can get 30 points, for a positive grade she or he must get at least 16 points,
- ii. discussion about test results,

b) in the scope of laboratories: verification of assumed learning outcomes is carried out by:

- i. assessment of student's preparation for individual sessions of laboratory classes ("entrance" test) and assessment of skills related to the implementation of laboratory exercises,
- ii. continuous assessment, during each class (oral answers) - rewarding the increase in the ability to use known principles and methods,
- iii. assessment of the laboratory reports prepared partly during the classes and partly at home; this assessment also includes teamwork skills.

Obtaining additional points for activity during classes, in particular for:

- i. discuss of additional aspects of the issue,
- ii. effectiveness of applying the acquired knowledge while solving a given problem,
- iii. ability to work as part of a team that practically performs a specific task in the laboratory,
- iv. comments related to the improvement of teaching materials,
- v. indicating students' perceptive difficulties enabling ongoing improvement of the didactic process.

### Programme content

The program includes the following content: layered models of computer networks, standards, services and protocols used in computer networks, basics of network design, principles of operation and configuration of selected network devices.

### Course topics

The lecture program includes the following topics:

1. Introduction. History of computer networks. OSI and TCP / IP models
  2. Signals and media, network access, layers 1 and 2 of the OSI model
  3. Local area network (LAN) design and documentation
  4. Communication, protocols, Internet Protocol v4, v6, subnets, layer 3 of the OSI model.
  5. Layers 4 - 7 of the OSI model
  6. Wide area networks (WAN), wireless networks, peer-to-peer networks
  7. Security in computer networks: types of attacks, firewalls, proxy servers, SSL, HTTPS, IPSEC protocols, 3DES, RSA data encryption algorithms, certificates, virtual private networks (VPN), rules for the systems, networks and connections security.
  8. Real-time networks, field networks, industrial Ethernet networks, time sensitive networking (TSN), Open Platform Communications Unified Architecture (OPC / OPC UA) standard.
- Laboratory classes are conducted in the form of thirteen 2-hour exercises taking place in the laboratory, preceded by a 2-hour introductory instructional session at the beginning of the semester and a 2-hour summary session at the end of the semester. Laboratory exercises are carried out by 2-person teams. The program of laboratory classes includes the following issues:
1. Computer network client configuration in the operating system
  2. E-mail server - installation, management basics
  3. Email server - security
  4. LAN network design, practical classes
  5. Subnet design
  6. Computer network simulator, basics of the configuring of network devices
  7. Static and dynamic routing
  8. Internet Telephony: Voice over Internet Protocol (VoIP)
  9. Wireless networks, router configuration
  10. Virtual LANs (VLANs)
  11. Address Resolution Protocol (ARP), Dynamic Host Configuration Protocol (DHCP)
  12. Data streaming over a computer network
  13. Internet of Things (IoT) devices in a computer network

### Teaching methods

1. Lecture: multimedia presentation illustrated with examples on the board
2. Laboratory classes: solving tasks, configuring of network components, performing of measurements, discussion, teamwork

### Bibliography

Basic:

1. Kurose J., Ross K. W., Sieci komputerowe. Ujęcie całościowe, Helion 2010
2. Bradford R., Podstawy sieci komputerowych, WKŁ 2009

Additional:

1. ISO, IEEE, ITU-T, ANSI standards, RFC (Request for Comments) documents

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00