COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computer network devices [S1EiT1>USK]

Course

Field of study
Electronics and Telecommunications

Year/Semester
3/6

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
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Students have a basic knowledge of computer networks, network protocols, and communication networks. They have a basic knowledge of C++/C programming languages. Students are able to find information in literature, as well as other reference sources. They are able to integrate and interpret obtained information, draw conclusions, and justify their findings. Students understand the necessity to acquire new knowledge and skills in their chosen field of study.

Course objective

To acquaint students with the functions of computer network devices located in particular layers of TCP/IP and OSI reference models. Presentation of the architecture of network devices such as routers, switches, devices acting in ADSL, passive optical networks. To acquaint students with access network standards. Presentation of network processors and NetFPGA architectures and implementations.

Course-related learning outcomes

Knowledge:
1. Possesses comprehensive knowledge of computer architecture.
2. Recognizes the hardware profiles of mobile devices and can identify their programming capabilities.

3. Has a foundational understanding of construction principles, standards, architecture, network protocols, and the operation of wide area and local area networks, with a particular focus on network devices.
4. Familiar with the principles of Linux driver development.
5. Familiar with the principles of implementing network devices using network processors and FPGAs.
Skills:
1. Capable of selecting the appropriate design of network devices based on technical requirements and operating conditions.
2. Competent in configuring network devices to perform basic network functions.
3. Able to match program capabilities with available hardware resources.
4. Proficient in writing and executing simple character drivers or network card drivers.
5. Capable of effective communication in Polish or English within professional and other environments.
Social competencies:
1. Demonstrates a sense of responsibility for designing electronic and telecommunications systems, understanding the potential dangers of their misuse to individuals and society. Familiar with principles related to information storage and access determination to ensure data security.
2. Acknowledges the impact of telecommunication and ICT systems and networks on shaping the environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Learning outcomes are verified with a written or oral test. The written test consists of 7-10 questions (multiple-choice and open-ended) that are scored differently (there are three or four score groups). The oral test contains 50-60 open-ended questions divided into three or four score groups. Students draw one question from each group. In the oral test, the teacher can ask one additional question for each drawn question. Both the main and additional questions are scored, taking into account the content range and understanding of the issue. The minimum number of scores required to pass the exam is equal to 50%.

Knowledge and skills acquired during tutorials are assessed through a project realized in the last classes. The project contains 5-6 tasks that are scored differently. Each task can be completed independently. The minimum number of scores required to pass the exam is equal to 50%. The assessment levels (lecture and tutorials) are as follows:
Number of scores mark
<=50 % 2,0
51% - 60% 3,0
61% - 70% 3,5
71% - 80% 4,0
81% - 90% 4,5
91% - 100% 5,0

Programme content

The course covers the structure of devices that implement the functions of individual layers of the OSI model. It includes a division and discussion of devices belonging to different network areas and domains (electrical and optical). The functioning of PON (Passive Optical Networks) is presented in detail. Issues related to programming network devices are also discussed.

Course topics

Lectures:
1. OSI RM and TCP/IP reference models, classification of computer network elements and devices
2. Router architecture, data forwarding, data queuing
3. Router functions: routing tables, path searching, operating systems, memories
4. Router market review
5. L2 switches architectures and functionality
6. Access networks – ADSL and VDSL standards and devices
7. Powering network devices – PoE standards
8. Passive optical networks: EPON, GEPON, GPON, XG-PON, NG-PON2, XGS-PON
9. Architectures of OLT and ONU

10. Drivers for network interface cards
11. Network processors – architectures and functionality, EZchip processors
12. Programmable network devices, NetFPGA cards
13. Network processors programming

Tutorials:
1. Simple character drivers in Linux
2. Network interface card drivers in Linux
3. Network processor applications: ping, traceroute
4. Network processor applications: router
5. Traffic scheduling in EPON networks
6. Data searching algorithms
7. Data structures in xCAM memories

Teaching methods

1. Lectures:
a) Multimedia presentations illustrated with examples presented on the board.
b) Practical case study of selected events in database management systems or programming languages runtime environment.

2. Laboratory classes: Solving problems given by the teacher (practical case study with network processors, NetFPGA, or Linux systems) complemented with multimedia presentations.

Bibliography

Basic
1. Wojciech Kabaciński, Mariusz Żal, Sieci telekomunikacyjne, WKŁ 2008
2. Rubini A., Linux - sterowniki urządzeń : system operacyjny kompatybilny z Uniksem (oprac. wersji pol. Krzysztof Łabanowski), Wydawnictwo RM, 1999

Additional
1. Ran Giladi, Network Processors, Morgan Kaufmann 2008,
2. Ethernet Passive Optical Networks Glen Kramer, McGraw-Hill 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	31	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	44	1,00