COURSE DESCRIPTION CARD - SYLLABUS

Course name
Software Defined Networks [S1Cybez1>SDP]

Course

Field of study
Cybersecurity

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
24

Laboratory classes
24

Other
0

Tutorials
0

Projects/seminars
16

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

A student starting this subject should have basic knowledge of computer networks, routing protocols, IT security and basic programming in Java and C/C++. They should also have the ability to obtain information from indicated sources and be willing to cooperate within a team. Basic knowledge on wireless systems.

Course objective

Providing students with knowledge of broadly understood networks defined by software SDN (Software Define Network), including the radio part SDR (Software Defined Radio), network function virtualization (NFV) and security challenges faced by the creators and administrators of these networks. Familiarizing students with practical aspects of creating SDN networks. Familiarizing students with the possibilities of using SDR platforms to create a software-defined wireless device, cognitive radio and the resulting application threats in the software-hardware layer.

Course-related learning outcomes

Knowledge:
The student has knowledge of standards related to software-defined networks and network function virtualization methods. [K1_W07]
The student has knowledge of the possibilities of using SDR platforms to launch software-defined networks, taking into account wireless aspects. [K1_W07]
The student understands the threats resulting from the use of software-defined SDR platforms as a basis for cognitive radio. [K1_W20]

Skills:
The student is able to configure the selected platform of software-defined network. [K1_U02]

Social competences:
The student understands the need for responsible use of flexible, programmatically defined solutions for the purposes of future cybersecurity systems - knowing their potential, she/he understands the social threats resulting from them. [K1_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified by an exam in written or oral form. In the written form, students must answer 7-10 questions (test and open-ended) with different scoring. There are three or four point groups. In the case of an oral exam, the student draws one question from each point group. In the oral form, for each drawn question, the student may receive an additional question (related to the drawn question). The assessment of the question (includes the answer to both the drawn question and the additional question) includes the range of answers and the depth of understanding of the issue. 50-60 questions are prepared for each exam. The condition for passing the exam is to obtain at least 50% of the possible points. Skills acquired during laboratory classes are verified on an ongoing basis. During each laboratory class, the correctness of the exercises is assessed on a scale of 0 to 10 points. The condition for passing the laboratory exercises is to obtain at least 50% of the possible points.
Number of points Note:
<=50 % 2,0
51% - 60% 3,0
61% - 70% 3,5
71% - 80% 4,0
81% - 90% 4,5
91% - 100% 5,0
The course completion rules and the exact passing thresholds will be communicated to students at the beginning of the semester through the university’s electronic systems and during the first class meeting (in each form of classes).

Programme content

The lecture topics include explaining the differences between traditional computer networks and software-defined networks, defining the basic elements of SDN networks and explaining their functions. Standards for software-defined networks are discussed. Solutions offered by hardware manufacturers for SDN networks are also presented. The lectures also discuss the concept of network function virtualization and its example applications. Discussion of issues related to the use of SDR software-defined platforms.

Course topics

I. Software-defined networks
a) Introduction, definitions, architectures
b) Standards and protocols used
c) SDN network elements
d) Examples of solutions offered by device manufacturers
II. Network function virtualization
a) NFV concept
b) NFV standards
c) NFV architecture

d) NFV requirements and challenges
e) Use cases and proven concepts
f) Review of available technologies
III. SDR software-defined radio
a) software-defined radio concept
b) presentation of selected SDR solutions and platforms
c) presentation of advantages and threats of using SDR platforms
d) SDR as a basis for cognitive radio
Laboratories and project
In the field of SDR - in the laboratories, students will have the opportunity to launch selected wireless systems using SDR platforms of the USRP type for this purpose.

Teaching methods

Informative lecture: multimedia presentation, illustrated with examples provided on the board.
Laboratory exercises: practical exercises in groups, using physical network devices and virtual environments

Bibliography

Basic:
1. Khondoker, Rahamatullah (Ed.): SDN and NFV Security - Security Analysis of Software-Defined Networking and Network Function Virtualization; Springer International Publishing 2018.
2. Guy Pyjolle: Software Networks: Virtualization, SDN, 5G and Security, John Wiley & Sons, 2015

Additional:
1.Shao Ying Zhu, Sandra Scott-Hayward, Ludovic Jacquin, Richard Hill: Guide to Security in SDN and NFV -
Challenges, Opportunities, and Applications. Computer Communications and Networks, Springer 2017.
2. Dijiang Huang, Ankur Chowdhary, Sandeep Pisharody: Software-Defined Networking and Security - From Theory to Practice, CRC Press, 2021

Breakdown of average student's workload

	Hours	ECTS
Total workload	139	5,00
Classes requiring direct contact with the teacher	64	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	2,50