COURSE DESCRIPTION CARD - SYLLABUS

Course name
Wireless software and open networks [S2Teleinf2-SDP>BS]

Course

Field of study
Teleinformatics

Year/Semester
2/3

Area of study (specialization)
Software-defined systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
14

Laboratory classes
24

Other
14

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student has knowledge of the design and architecture of programmable digital circuits and the possibilities of their practical applications The student has knowledge of modern mobile radio communication systems and modern technologies used in these systems

Course objective

Understanding the fundamentals and key challenges of programmable and open radio systems, cognitive radio and dynamic spectrum access methods; Implementation of a software-defined radio system

Course-related learning outcomes

Knowledge:
1.Understands the concept of open and programmable wireless networks, understands the methodology of their design and program description [K2_W04]
2. Knows and understands algorithms used in open, wireless IT systems [K2_W05]
3. Knows and understands advanced artificial intelligence methods used in the design of open and programmable wireless networks [K2_W06]
4. Has knowledge of development trends in the field of wireless telecommunications and ICT [K2_W07]

5. Has knowledge of selected issues of copyright and industrial property protection from the perspective of providing applications for OpenRAN systems [K2_W09]

Skills:
1. Is able to work individually and in a team to propose algorithms for open and programmable wireless networks, and is also able to assess the time consumption of the task [K2_U02]
2. Is able to apply known solutions and methods in the field of artificial intelligence, mathematical models and advanced algorithms to implement projects for open and programmable wireless networks [K2_U06]
3. Is able to propose the structure of the Open RAN system, taking into account legal aspects and principles of intellectual property protection [K2_U08]
4. Is able to assess the usefulness and possibility of using new achievements in the field of wireless telecommunications techniques, especially innovative solutions [K2_U10]
5. Is able to assess the changing legal and social environment from the perspective of the development of open wireless networks
6. When creating software for open and programmable networks, he/she can integrate knowledge from various areas of telecommunications and IT. [K2_U15]

Social competences:
1. Understanding the intensity of changes in the context of designing wireless open and wireless networks, is ready to recognize the importance of knowledge in solving cognitive problems; can also critically analyze the learned content[K2_K01]
2. Is ready to fulfill social obligations, understanding social conditions resulting from changes in the process of creating wireless networks [K2_K02]
3. Is ready to think and act in an entrepreneurial way in the context of offering new solutions in the field of open and programmable wireless networks [K2_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified on the basis of a written or oral test. It consists of several questions (typically 4-5) open from the list of provided issues, scored differently. The passing threshold is 51% of the points.
The skills acquired during laboratory classes are verified on the basis of completed exercises, tasks and mini-projects. Achieve at least 50% of the maximum number of points is required.
Grading scale: <50% - 2.0 (ndst); 50% to 59% - 3.0 (dst); 60% to 69% - 3.5 (dst+) ; 70% to 79% - 4.0 (db); 80% to 89% - 4.5 (db+); 90% to 100% - 5.0 (bdb).

Programme content

The course focuses on the software defined radio (SDR) systems, cognitive radio and Open-RAN

Course topics

Lecture:
1. Introduction: Software Defined Radio, SDR, definitions, motivations for SDR, desirable features of radios, key technical challenges,
2. Conventional and ideal radio architecture, practical architectures, key challenges
3. Requirements for SDR RF front-end and transceiver antennas
4. Basic hardware and software modules in SDR
5. Cognitive radio (CR), features, definitions, challenges
6. Sensing, learning and adapting in CR
7. CR hardware platforms
8. Open networks - OpenRAN, technology and challenges
Laboratory project:
1. SDR transceiver hardware architecture
2. Programming the SDR software platform
3. Universal Software Radio Platform (USRP)
4. Virtual RAN station and open radio

Teaching methods

The traditional form will be used as the basis for presenting the lecture content, where the presentations will be displayed using a projector. However, interactive approaches will also be implemented, in which problem-based lectures and discussion will be used.

Bibliography

Basic:
E. Hossein, D. Niyato, Z. Han, Dynamic Spectrum Access and Management in Cognitive Radio Networks, Cambridge University Press, Cambridge, UK, 2009

Additional:
A.M. Wygliński, M. Nekovee, Y.T. Hou, (ed.) Cognitive Radio Communications and Networks. Principles and Practice, Elsevier Academic Press, USA 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	103	4,00
Classes requiring direct contact with the teacher	38	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50