COURSE DESCRIPTION CARD - SYLLABUS

Course name
Wireless Personal Networks [S1MiKC1E>BSO]

Course

Field of study
Microelectronics and Digital Communication

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

dr hab. inż. Adrian Kliks prof. PP
adrian.kliks@put.poznan.pl

Lecturers

Prerequisites

The student has knowledge of the basics of wireless communication, mobile radio communication systems and modern technologies used in these systems. The student has knowledge of microprocessors used in portable devices. XD

Course objective

To familiarize students with the principles of operation and possibilities of using very short-range wireless networks (so-called personal area networks) in various situations, both in the home and industrial context.

Course-related learning outcomes

Knowledge:
1. Understands the principle of operation of short-range wireless networks, knows the principles of their creation and practical use.
2. Knows and understands selected algorithms used in wireless personal networks
3. Has knowledge of development trends in the field of wireless telecommunications in the field of short-range systems

Skills:
The student is able to configure a short-range wireless personal network for private and industrial use.
Is able to assess the usefulness and possibility of using new achievements in the field of short-range wireless telecommunications techniques
Is able to assess the changing legal and social environment from the perspective of the development of wireless personal networks

Social competences:
The student understands the need for responsible use of short-range wireless networks and, knowing their potential, understands the application and social challenges associated with them.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified on the basis of a written test, typically consisting of several open-ended questions (typically 5) from a list of provided topics, scored differently. The pass threshold is 50% of points. Skills acquired during laboratory classes are verified on the basis of completed exercises, tasks and mini-projects. It is required to obtain at least 50% of the maximum number of points or to complete the presented exercises at least halfway. Project will be evaluated based on achieveing also at least of 50% of all possible points.
Grading scale: <50% - 2.0; 50% to 59% - 3.0; 60% to 69% - 3.5; 70% to 79% - 4.0; 80% to 89% - 4.5; 90% to 100% - 5.0.

Programme content

The subject of the course focuses on issues related to short-range wireless personal area networks, in particular the so-called WPAN networks and, to a limited extent, WBAN.
XD

Course topics

Lecture:
1. (Unit 1) Introduction to WPAN (Definition and characteristics of wireless personal area networks)
2. (Unit 1) WPAN standards (Bluetooth (IEEE 802.15.1) - architecture, operating modes, topologies; ZigBee (IEEE 802.15.4) - protocol basics, applications in IoT; Z-Wave - mesh networks in automation, Ultra-Wideband (UWB, IEEE 802.15.4a/4z) - applications in precise location
3. (Unit 2) WPAN communication architecture and protocols
4. (Unit 2)Bluetooth (Bluetooth classes and versions (Classic, LE, 5.0, 5.1, 5.2, 5.3), Bluetooth profiles and their applications (A2DP, HID, HSP, BLE GATT))
5. (Unit 3) ZigBee and mesh networks in WPAN (ZigBee model topology and layers, ZigBee standard vs. other WPAN solutions, Applications in smart buildings and industry)
6. (Unit 4) UWB and location technologies in WPAN (Characteristics of UWB signal and its advantages, Comparison of UWB with other location technologies (BLE, RFID))
7. (Unit 5)NFC technology
8. (Unit 6) WPAN in medical and industrial applications (WPAN standards in telemedicine (Bluetooth Medical, ANT+), Body sensor networks (WBAN - Wireless Body Area Networks), Application of WPAN in industry 4.0 and automation systems)
9. (Unit 6) The future of WPAN and technology development
Assessment is scheduled to be organized at the last class.
Laboratories
1. Creation of Bluetooth networks in various configurations (2 units)
2. Use of ZigBee networks in various configurations (3 units)
3. Use of NFC connections (1-2 units)
Project:
Preparation of the complete system utilizing the benefits of the personal wireless networks (all units)
As a unit, 1.5 meeting is considered.

Teaching methods

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

problem-based lectures and discussions will be used.
XD
Laboratory exercises: practical exercises in groups of two people at most.
Project classes: implementation of a group project (work in groups) allowing for the creation of a larger system using personal communication techniques.

Bibliography

Basic:
„Bluetooth Low Energy: The Developer's Handbook” Robin Heydon
Standards defining particular technologies

Additional:
Beginning NFC: Near Field Communication with Arduino, Android, and PhoneGap, Tom Igoe, Don Coleman, Brian Jepson, O'Reilly

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