COURSE DESCRIPTION CARD - SYLLABUS

Course name
Internet of things [S1SI1E>IOT]

Course

Field of study
Artificial Intelligence

Year/Semester
4/7

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
0

Number of credit points

3,00

Coordinators

dr hab. inż. Paweł Śniatała prof. PP
pawel.sniatala@put.poznan.pl

Lecturers

Prerequisites

A student starting this course should have a basic knowledge of digital electronics, microcontrollers, and microprocessors. He should have knowledge to be able to design and implement computer programs in chosen programming languages (e.g., C, Python) He should also have the ability to obtain information from the indicated sources and be ready to cooperate as part of a team. In the area of social competence, he must present attitudes such as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, and respect for other people.

Course objective

To provide students with knowledge of the Internet of Things (IoT). Students will learn the principles of operation and applications of selected sensors/sensors, and become familiar with selected platforms integrating IoT (platforms based on microcontrollers (e.g. Arduino) and minicomputers (Raspberry Pi).

Course-related learning outcomes

Knowledge
- Has structured and detailed theoretical knowledge of key computer science concepts in the field of the Internet of Things (IoT), including

data processing in IoT systems. (K1st_W3)
- Knows and understands the fundamental techniques, methods, algorithms, and tools used in solving computer science problems related to the Internet of Things (IoT). (K1st_W4)
- Possesses basic knowledge of major development trends and the most significant achievements in the field of the Internet of Things (IoT). (K1st_W5)

Skills
- Is able to formulate and solve complex computer science problems, with particular emphasis on the Internet of Things (IoT), using appropriately selected methods, including analytical, simulation-based, and experimental approaches. (K1st_U3)
- Is able to perform critical analysis and evaluation of the operation of IT systems in the area of the Internet of Things (IoT). (K1st_U7)
- Has the ability to adapt existing algorithms as well as formulate and implement new algorithms, including algorithms typical for IoT systems, using at least one widely adopted development tool. (K1st_U9)
- Is able to apply and adapt intelligent behavior models and IT tools used for simulating such behaviors. (K1st_U11)

Social Competencies
- Understands that in computer science, particularly in the field of Artificial Intelligence, knowledge and skills rapidly become outdated, and recognizes the need for continuous learning and professional development. (K1st_K1)
- Is aware of the importance of knowledge and scientific research related to computer science and Artificial Intelligence in solving practical problems of key importance for individuals, companies, organizations, and society as a whole. (K1st_K2)
- Is aware of the social role of a graduate of a technical university; in particular, understands the need to communicate information and opinions concerning engineering activities, achievements in Artificial Intelligence, and other aspects of the work of an IT specialist in Artificial Intelligence in a clear and accessible manner to society. (K1st_K6)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired in the lecture is verified through a written exam or quiz on the eKursy platform.
The scope of required knowledge is presented during the lecture.
The exam includes five to ten questions. Each question is scored equally. The passing threshold is 50% of the total points possible.
Skills acquired in laboratory classes are verified on an ongoing basis. During each laboratory class, the correctness of the exercises is evaluated on a scale of 2 to 5. The final grade is the average of the grades obtained in each lab class. The final grade is the average of the grades obtained from individual laboratory classes.

Programme content

Lecture Topics:
- Internet of Things (IoT): applications, systems, devices, and sensors.
- Operating principles of selected sensors used in IoT systems.
- Overview of selected IoT hardware platforms.
- IoT device connectivity and communication (networking technologies).
- Data processing in IoT systems (Big Data, Cloud Computing, Fog Processing).
- Internet of Things cybersecurity and security mechanisms.

Course topics

Lecture Topics:
- Internet of Things (IoT): applications, systems, devices, and sensors.
- Operating principles of selected sensors used in IoT systems.
- Overview of selected IoT hardware platforms.
- IoT device connectivity and communication (networking technologies).
- Data processing in IoT systems (Big Data, Cloud Computing, Fog Processing).
- Internet of Things cybersecurity and security mechanisms.

Laboratory Topics:
- Using Arduino platforms to acquire environmental data (temperature sensors, photoresistors, etc.).
- Emergency shutdown of a production process in response to environmental alarms (Raspberry Pi, JSON, MongoDB).
- Using Packet Tracer to test Smart City and Smart Grid solutions.
- Prototyping and testing Smart Home installations using Packet Tracer (Python, Single Board Computer, smartphone/tablet, router, door opening sensor, etc.).
- Smart camera system with smile detection functionality (Raspberry Pi, Raspberry Pi Camera, Python, Machine Learning).
- Configuration of an Intrusion Prevention System (IPS).
- Security vulnerability testing of basic IoT solutions (Sensor–Actuator Systems, IFTTT) in the field of cybersecurity.
- MQTT hacking and security analysis (Raspberry Pi, IoTSec Kali VM, network connectivity).

Teaching methods

Lectures: multimedia presentations, illustrated with examples given on the blackboard.
Laboratory exercises: practical exercises in groups with the use of hardware platforms.

Bibliography

Basic
1. Dominique Guinard, Vlad Trifa: Building the Web of Things, Manning Publications, June 2016. ISBN 9781617292682.
2. Jerzy Kluczewski: Internet rzeczy IoT i IoE w symulatorze Cisco Packet Tracer. Praktyczne przykłady i ćwiczenia. Seria Packet Tracer, Wydawnictwo iTstart, 2018.
Additional
1. Amita Kapoor: Hands-On Artificial Intelligence for IoT: Expert machine learning and deep learning techniques for developing smarter IoT systems, Packt Publishing, 2019.
2. Colin Dow: Mastering IoT, Packt Publishing, 2019. EAN: 9781838645434
3. Marcin Sikorski, Adam Roman: Internet Rzeczy, Wydawnictwo Naukowe PWN 2020. ISBN: 9788301208400

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50