# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Internet of Things [S1EiT1E>IR]

## 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
English

Form of study
full-time

Requirements
elective

## Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

## Number of credit points

3,00

## Coordinators

prof. dr hab. inż. Mariusz Głąbowski
mariusz.glabowski@put.poznan.pl

## Lecturers

## Prerequisites

A student joining this course should have basic knowledge of TCP / IP stack protocols. He/she should understand the communication process between network devices and know the basics of object oriented programming.

## Course objective

The aim of the module is to familiarize students with key hardware and software elements of the Internet of Things. Students will learn the areas of Internet of Things applications and problems related to human-machine interaction. The module also aims to familiarize students with the methods, techniques and tools used in the design and optimization of the Internet of Things as well as with the basic tools for Big Data analytics.

## Course-related learning outcomes

Knowledge:
1. A student has a systematic knowledge of key technologies of the Internet of Things.
2. A student has a basic, systematic knowledge of structure, operation and standards related to the Internet of Things.

3. A student knows the basics of traffic engineering, services, devices and network protocols used in the Internet of Things.
4. A student knows the basic software tools (Python libraries) for Big Data analytics.

Skills:
1. A student is able to select the proper technologies for securing data transmission in the Internet of Things architecture.
2. A student is able to configure devices used in the Internet of Things.
3. A student is able to apply Python libraries for analysis of Big Data datasets.

Social competences:
1. A student knows the limits of his/her own knowledge and skills, understands the need for further training in the field of Internet of Things.
2. A student understands that knowledge and skills in the field of Internet of Things are becoming obsolete very quickly.
3. A student is aware of the need for a professional approach to design solutions based on Internet of Things approach. He/she can effectively participate in team projects.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Knowledge acquired as part of the lecture is verified by an oral and / or written test.
Test issues, on the basis of which questions are prepared, are sent to students by e-mail using the university e-mail system.
The written and / or oral test consists of from 3 to 5a questions for which a descriptive answer is expected. Each answer to a question is rated on a scale of 0 to 5 points. Each question is scored equally.
Passing threshold: 50% of points.
In the case of the oral test, students draw questions from a set of 30 questions. In the case of a written test, questions are selected by the teacher.
Skills acquired as part of the laboratory are verified on an ongoing basis. At the end of each laboratory class, the correctness of configuration of network devices is assessed on a scale of 2 to 5. The final grade is the average of grades obtained from individual laboratory classes.

## Programme content

- Intelligence and capabilities of modern machines;
- The basic concepts of the Internet of Things;
- Typical applications of Internet of Things;
- Basic functional elements and techniques of the Internet of Things;
- Traffic control in the Internet of Things;
- Network technologies for the Internet of Things;
- Introduction to Big Data: characteristics and value of data, data storage, data processing;
- Cloud and fog processing;
- The value of data in business, social and environmental applications;
- Database systems for the Internet of Things;
- Techniques for analyzing large data sets (Python libraries);
- Internet of Things security.

## Course topics

1. The following topics will be discussed as part of the lecture:
- Intelligence and capabilities of modern machines (sensors, controllers, etc.);
- The basic concepts of the Internet of Things;
- Typical applications of Internet of Things;
- Basic functional elements and techniques of the Internet of Things;
- Arduino and Raspberry Pi;
- Traffic control in the Internet of Things;
- Network technologies for the Internet of Things;
- Introduction to Big Data: characteristics and value of data, data storage, data processing;

- Cloud and fog processing;
- The value of data in business, social and environmental applications;
- Database systems for the Internet of Things;
- Techniques for analyzing large data sets (Python libraries);
- Basics of artificial intelligence and machine learning;
- Internet of Things security.
2. The following lab exercises will be carried out as part of the laboratory classes:
- Installation and configuration of IoT devices;
- Interacting with a physical world using Arduino devices;
- Interacting with a physical world using Raspberry Pi devices;
- Interfacing Arduino code and Python code;
- Working with Python and SQLite;
- Big Data - descriptive statistics and correlation analysis in Python;
- Image Processing Change Detection using Raspberry Pi.

## Teaching methods

Informative lecture: multimedia presentation, illustrated with examples on the board.
Laboratory exercises: practical exercises in groups using Arduino, Raspberry PI, Python, Jupyter Notebook, Cisco Packet Tracer.

## Bibliography

Basic
1. Big Data and the Internet of Things : enterprise information architecture for a new age. Autor: Stackowiak, Robert., Licht, Art., Mantha, Venu., Nagode, Louis., Apress Media, 2015.
2. Internet of Things: global technological and societal trends. Autor: Vermesan, Ovidiu., Friess, Peter., River Publishers. River Publishers, 2011.
Additional
1. Curriculum available on the cisco.netacad.net platform as part of the Cisco Network Academy run at the Institute of Communication and Computer Networks.
2. Erik Brynjolfsson, The second machine age: work, progress and prosperity in a time of brilliant technologies; W. W. Norton & Company, 2016
3. Gaston C. Hillar, Internet of Things with Python Paperback, Packt Publishing, 2016

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 90 | 3,00 |
| Classes requiring direct contact with the teacher | 55 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 35 | 1,00 |