



## Subject card

|   |   |   |                                     |  |  |         |     |
|---|---|---|-------------------------------------|--|--|---------|-----|
| Subject name and code                       | Introduction to Internet of Things, PG_00054484   |   |                                     |  |  |         |     |
| Field of study                              | Automation, Robotics and Control Systems  |   |                                     |  |  |         |     |
| Date of commencement of studies             | February 2023   | Academic year of realisation of subject   |                                     |  | 2023/2024  |         |     |
| Education level                             | second-cycle studies  | Subject group   |                                     |  |  |         |     |
| Mode of study                               | Full-time studies   | Mode of delivery  |                                     |  | at the university                                    |         |     |
| Year of study                               | 2   | Language of instruction   |                                     |  | Polish   |         |     |
| Semester of study                           | 3   | ECTS credits  |                                     |  | 2.0  |         |     |
| Learning profile                            | general academic profile  | Assessment form   |                                     |  | assessment   |         |     |
| Conducting unit                             | Department of Control Systems Engineering -> Faculty of Electrical and Control Engineering  |   |                                     |  |  |         |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor  | dr inż. Robert Smyk   |                                     |  |  |         |     |
|   | Teachers  | dr inż. Robert Smyk   |                                     |  |  |         |     |
| Lesson types and methods of instruction     | Lesson type   | Lecture   | Tutorial                            | Laboratory   | Project  | Seminar | SUM |
|   | Number of study hours   | 15.0  | 0.0                                 | 0.0  | 15.0   | 0.0     | 30  |
|   | E-learning hours included: 0.0  |   |                                     |  |  |         |     |
|   | Address on the e-learning platform: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11783">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=11783</a>   |   |                                     |  |  |         |     |
| Learning activity and number of study hours | Learning activity   | Participation in didactic classes included in study plan                            | Participation in consultation hours | Self-study   | SUM  |         |     |
|   | Number of study hours   | 30  | 8.0                                 | 12.0   | 50   |         |     |
| Subject objectives                          | Introduction to Internet of Things (IoT) systems, getting to know typical architectures, concepts of designing hardware and software for IoT. Introduction to the design aspects of IoT edge devices. Acquisition of basic programming skills in a selected environment dedicated to IoT.   |   |                                     |  |  |         |     |
| Learning outcomes                           | Course outcome  | Subject outcome   |                                     |  | Method of verification                               |         |     |
|   | K7_W06  | He knows the basic architectures of IoT systems                                     |                                     |  | [SW1] Assessment of factual knowledge                |         |     |
|   | K7_U03  | Can prepare an raport   |                                     |  | [SU1] Assessment of task fulfilment                  |         |     |
|   | K7_U04  | Analyzes the technical data contained in the documentation of the electronic module |                                     |  | [SU2] Assessment of ability to analyse information   |         |     |
|   | K7_U07  | He knows the basics of working in the IDE programming environment                   |                                     |  | [SU4] Assessment of ability to use methods and tools |         |     |
| K7_W11                                      | He can program the elementary method of data transfer using the selected protocol   |   |                                     | [SW3] Assessment of knowledge contained in written work and projects |  |         |     |
| Subject contents                            | <p>Basic concepts of IoT (internet of things), application examples. What features does a smart device have? Principles of building IoT systems. Layered structure of the IoT system. Examples of selected IoT architectures. Basics of communication in the structure of IoT. Principles of communication programming in the layers of the IoT system (inter-system communication protocols (I2C, SPI, USART etc.), between modular (Bluetooth, ZigBee) and inter-layer (Ethernet, Wifi)). Inter-process programming. Elements of OS / RTOS in IoT. Basics of the IoT cloud, data analysis, visualization. IoT security basics. Managing energy consumption in IoT edge devices.</p> |   |                                     |  |  |         |     |
| Prerequisites and co-requisites             | Basics of microprocessor technology, operating systems, basics of programming, computer networks  |   |                                     |  |  |         |     |

| Assessment methods and criteria                                | Subject passing criteria   | Passing threshold   | Percentage of the final grade |
|--|--|---|-------------------------------|
|  | final project  | 60.0%   | 50.0%                         |
|  | exercises  | 60.0%   | 50.0%                         |
| Recommended reading  | Basic literature   | <ol style="list-style-type: none"> <li>1. Giacomo Veneri , Antonio Capasso , Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0, Packt Publishing; 1st edition (November 29, 2018)</li> <li>2. Dr Kamlesh Lakhwani , Dr Hemant Kumar Gianey , Joseph Kofi Wireko, Internet of Things (IoT): Principles, Paradigms and Applications of IoT, BPB Publications; 1st edition (February 27, 2020)</li> <li>3. Samuel Greengard, The Internet of Things (The MIT Press Essential Knowledge series), The MIT Press (March 20, 2015)</li> <li>4. John Rossman, The Amazon Way on IoT: 10 Principles for Every Leader from the World's Leading Internet of Things Strategies, December 20, 2016</li> </ol> |                               |
|  | Supplementary literature   | <ol style="list-style-type: none"> <li>1. Bruce Sinclair , IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy Hardcover May 29, 2017</li> <li>2. Dokumentacja bibliotek Mbed OS, <a href="https://os.mbed.com/">https://os.mbed.com/</a></li> </ol>   |                               |
|  | eResources addresses   | Adresy na platformie eNauczenie:<br>WPROWADZENIE DO INTERNETU RZECZY [2023/24] - Moodle ID: 36049<br><a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36049">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=36049</a>  |                               |
| Example issues/<br>example questions/<br>tasks being completed | <p>List the basic features of an intelligent device in the IoT structure.</p> <p>List and discuss the layers of the IoT system.</p> <p>List the protocols and discuss the methods of communication in the various layers of the IoT.</p> <p>Provide an interprocess management method in an edge device IoT application.</p> |   |                               |
| Work placement   | Not applicable   |   |                               |