

# SYLLABUS

## Course description

| Course description                                |                            |   |                             |                        |
|---|----------------------------|---|-----------------------------|------------------------|
| Course code                                       |                            | Course  | ROBOTYZACJA I AUTOMATYZACJA |                        |
| ME/O/1/ST/C7a                                     |                            |   | ROBOTIZATION AND AUTOMATION |                        |
| Language of instruction                           |                            | English   |                             |                        |
| Academic year                                     |                            | 2025/2026   |                             |                        |
|   |                            |   |                             |                        |
| field of study:                                   |                            | Mechanical engineering  |                             |                        |
| field of specialisation:                          |                            | All   |                             |                        |
| Educational level                                 |                            | first-cycle studies   |                             |                        |
| Education profile                                 |                            | General academic  |                             |                        |
| Mode of study                                     |                            | Full-time studies   |                             |                        |
| Semester(s)                                       |                            | 6   |                             |                        |
|   |                            |   |                             |                        |
| Affiliation with a group of classes               |                            | C . Group of courses to choose from   |                             |                        |
| Course status                                     |                            | Electable   |                             |                        |
| Types of classes, instruction hours, ECTS credits |                            | Types of classes  | Number of instruction hours | Number of ECTS credits |
|   |                            | Lecture   | 15[h]                       | 5 ECTS                 |
|   |                            | Classes   | 45[h]                       |                        |
| Linkage of the course                             | with the education profile | related to the conducted scientific activity in the discipline to which the field of study is assigned            |                             | 5 ECTS                 |
|   | with qualifications        | it serves the student's acquisition of engineering competences  |                             | 5 ECTS                 |
|   | with science discipline    | Mechanical engineering  |                             | 5 ECTS                 |
| Form of teaching                                  |                            | Traditional – classes organized at the University /classes conducted using online learning methods and techniques |                             |                        |
| Prerequisites                                     |                            | Electrical engineering and electronics, Mechatronics and Automatics, Industrial Controllers PLC                   |                             |                        |
|   |                            |   |                             |                        |
| Department  |                            | Faculty of Mechanical Engineering, UTH Rad  |                             |                        |
| Coordinator                                       |                            | Dr hab. inż. Andrzej Puchalski, prof. UTH   |                             |                        |
| The website of the basic organizational unit      |                            | http://wm.uniwersytetradom.pl   |                             |                        |
| E-mail address, phone number of the coordinator   |                            | <a href="mailto:andrzej.puchalski@urad.edu.pl">andrzej.puchalski@urad.edu.pl</a>                                  |                             |                        |

## LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

|   |   |
|---|---|
| Learning Objective:   | C1 – Introduction to the topic of industrial digitization.<br>C2 – Familiarization with the principles of designing and operating robotics and automation systems in production processes..   |
| Curriculum Content:   | <p><b>LECTURE</b><br/> Example of a production process. Modular Production Line (MLP) P4.0 featuring an AGV robot, a collaborative robot, and an industrial robot. Elements and configuration of the cyber-physical Modular Production Line MLP+AR/VR. Devices and electropneumatic control systems of the MLP. Mapping and navigation of the mobile AGV robot. Cobot with an extended machine learning system. Creation, execution, and visualization of orders in the MES4 production execution system. Intelligent, computer-integrated manufacturing system (i-CIM) with CIROS software for virtual production environments. Smart maintenance system with an energy monitoring software package.</p> <p><b>LAB</b><br/> Familiarization with the structure and components of the MLP. Configuration of the transport system. Recording information using intelligent sensors. Launching the production line demonstrator control via PLC. Binary identification using RFID and communication based on networking technologies. Integration of new application modules using cyber-physical systems. Navigation, positioning, and docking of the AGV transport robot. Creating maps for autonomous AGV driving. Entering orders into the MES system. Creation, management, control, and visualization of customer orders in the production execution system (MES)</p> |
| Didactic (educational) methods:   | <ul style="list-style-type: none"> <li>• problem methods (problem lecture, conversational lecture),</li> <li>• simulation methods,</li> <li>• practical methods (demonstration, laboratory exercises, project method, simulation)</li> </ul>  |
| Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade: | <p>The condition for passing the course is to achieve all the required learning outcomes specified for the subject.</p> <p>Lectures are passed on the basis of a written test.</p> <p>Completion of the laboratory requires the performance of exercises and obtaining positive grades from entrance cards and reports.</p> <p>The method of calculating the final grade for the course is specified in the regulations.</p>  |

| Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes |  |                                       |                  | Methods of verifying learning outcomes |                                   |
|--|--|---------------------------------------|------------------|--|-----------------------------------|
| Learning outcome number  | Description of the learning outcomes for the course (PEU)<br>A student who has passed the course ( <b>W</b> ) knows and understands / ( <b>U</b> ) can / ( <b>K</b> ) is ready to: | Field of study learning outcome (KEU) | Types of classes | Form of verification (credits)         | Methods of testing and assessment |
| W1   | Knows and understands new technologies and trends accompanying the fourth industrial revolution P4.0.  | K_WG18<br>K_WG19                      | Lecture          | Test                                   | Pass a subject                    |
| U1   | Can design, program, and operate a robotics and automation system for production processes.  | K_UW05<br>K_UW12                      | Lecture/lab      | Test                                   | Pass a subject                    |
| K1   | Is ready to supplement and critically evaluate specialist knowledge and is able to select appropriate sources of knowledge and learning methods.                                   | K_KK01<br>K_KK02                      | Lab              | Test                                   | Pass a subject                    |

|                              |
|------------------------------|
| Literature and teaching aids |
|------------------------------|

1. New Paradigm of Industry 4.0, Patanik S., Springer AG 2020
2. Industry 4.0 and Engineering for Sustainable Future, Dastbaz M., Cochrane P., Springer AG 2019
3. Internal lectures and tutorial materials, Puchalski A. and others [www.mechatronika.uniwersytetradom.pl](http://www.mechatronika.uniwersytetradom.pl)

| Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits |  |                  |
|--|--|------------------|
| Attendance, participation  | Student workload [h].  |                  |
|  | Student's self-study hours<br>Classes without a teacher<br>(ZBN) | Classes          |
| Participation in lectures/classes/lab  | X  | 15 [h] / 45 [h]  |
| Preparation for lectures/classes/lab ,<br>Preparation for ... credit / exam                      | 10 [h] / 30 [h]<br>5 [h] / 20 [h]                                | X                |
| Total student workload Preparation for ... credit / exam   | 65 [h]/ 2,6 ECTS   | 60 [h]/ 2,4 ECTS |
| ECTS points per subject  | 5 ECTS   |                  |

| Additional information, comments  |
|---|
| <p>In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate.</p> <p>Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekłe chorych).</p> |

