MODULE DESCRIPTION CARD – SYLLABUS

Module name:	Number of hours:	Lecturer:
Foundations of Robotics	10	Bartłomiej Kulecki, MSc

Module Descriptions:

The course introduces students to selected fundamental concepts, methods, and tools in modern robotics. It covers core topics such as robot architectures, sensors and actuators, kinematics, perception, and basic control strategies. A particular emphasis is placed on hands-on experience with the Robot Operating System (ROS 2), enabling students to build, program, and simulate robotic systems. Through practical exercises and case studies, students will gain insight into essential aspects of robot design and operation. The course provides a broad but introductory foundation, preparing students for further study and specialization in robotics.

Purpose of the support under Module:

The overall objective of the Innovative International Education Program in ICT within the IMPACT project is to raise the competencies of international students in key digital technologies and to support personalized, flexible, and modern education aligned with current global needs in the area of ICT.

The specific objective of the module is to provide competencies and promote activities carried out at the Poznań University of Technology in the area of robotics education and research, with a focus on fundamental concepts, kinematics, perception, control, and practical skills in the Robot Operating System (ROS 2) and simulation environments.

Method of support under Module:

Support within the module is provided with the participation of the instructor and divided into the following elements:
- 6-week self-study program using teaching materials provided by the instructor on the e-learning platform;
- 6 weeks of support from the instructor in the form of online consultations using tools that enable meetings to be held;
- a test to verify the acquisition of competences.

Module-related learning outcomes:

Descriptions of the new competences:

The main objective of this module is to develop students' foundational knowledge and practical skills in robotics. Upon completion of the course, the student will acquire the following specific competences:

Knowledge:
- The student knows and understands fundamental concepts of robotics, including robot architectures, sensors, actuators, kinematics, perception, and control strategies.
- The student has knowledge of the Robot Operating System (ROS 2), including its architecture, tools, and applications in programming and simulation of robotic systems.
- The student understands basic methods for robot simulation, motion planning, and integration of sensory data for robot control.

Skills:
- The student can implement simple robotic applications using ROS 2, including nodes, topics, services, parameters, and simulation environments.
- The student is able to apply principles of robot kinematics, perception, and control to design, program, and test selected robotic tasks.
- The student can integrate and calibrate selected sensors and use them to acquire data for controlling a robotic system.

Social competences:
- The student is aware of the rapid development of robotics and artificial intelligence and recognizes the need for continuous learning to keep up with new methods and technologies.
- The student can work effectively in teams on practical robotics tasks and demonstrates openness to interdisciplinary collaboration.

Criteria for verifying learning outcomes
Learning outcomes presented above are verified with the use of the module assessment test.

Method of verification/validation of learning outcomes
The verification of assumed learning objectives is based on answers to questions in the assessment test. The amount of correct answers required to pass the test is 50% of the total number of questions.

Workload
25 h (including work with teaching materials provided by the lecturer, consultation, and the student's own work) – 1 ECTS point

Level of the European Qualifications Framework

POZNAN UNIVERSITY OF TECHNOLOGY