COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basic tools and software for autonomous robots

Course

Field of study
Control and robotics
Area of study (specialization)
Robotics and autonomous systems
Level of study
Second-cycle studies
Form of study
full-time

Year/Semester
1/1
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
30
Laboratory classes
30
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
Dominik Belter, PhD, Dsc

Responsible for the course/lecturer:

Prerequisites

A student starting this course should have basic knowledge of robotics and programming. He or she should also have the ability to obtain information from various sources and be ready to cooperate within the team.

Course objective

To provide students with knowledge about the tools used to program autonomous robots, the correct use of these tools and the integration of control systems.

Course-related learning outcomes

Knowledge

Skills

Social competences

1. Is aware of the necessity of a professional approach to technical tasks, in-depth familiarization with documentation and environmental conditions in which devices and their components may operate

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified by one 45-minute exam conducted in an examination session. The examination consists of 20-30 (test) questions and up to 5 open questions, differently scored. The credit threshold: 50% of points. Issues for the examination, on the basis of which the questions are developed are made available during the lecture.

Skills acquired during the laboratory classes are verified on the basis of a credit colloquium consisting of 20 questions and checking the practical implementation of the traffic planning problem. The credit threshold: 50% of points.

Programme content

Lecture:

1 System scripts in bash/python, cron, bashrc, services

Programming the Discovery chip from Linux

3. udev rules, fixed names for USB devices, low latency for USB communication

4. ROS node for communication in USB and publishing data

5. concurrent processing in C++ (threads, processes)

6 CUDA (performing operations on a graphic card)

7 Tensorflow + ROS (start up the network detecting objects in ROS)

8 Remote Master (ROS on multiple computers)

9 ArUco object detection for calibration

10 ROS bags (collection of data from camera for calibration)

11 TFs in ROS (reading transformations from previously saved ROS-bags)

12 Calibration of easyHandEye cameras (on ROS-bags)

Laboratory:

1 System scripts in bash/python, cron, bashrc, services

Programming the Discovery chip from Linux

3. udev rules, fixed names for USB devices, low latency for USB communication

4. ROS node for communication in USB and publishing data

5. concurrent processing in C++ (threads, processes)

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Teaching methods

1. lecture: multimedia presentation, illustrated with examples given on the board.

2. laboratory exercises: instructions carried out on computers and robots available in the laboratory

Bibliography

Basic

Mark Mitchell, Jeffrey Oldham, Alex Samuel, Advanced Linux Programming, New Riders Publishing

Robot Operating System (ROS), Springer 2016

Additional

M. Galewski, STM32. Aplikacje i ćwiczenia w języku C, Wydawnictwo BTC, Legionowo 2011

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	1,5

1 delete or add other activities as appropriate