COURSE DESCRIPTION CARD - SYLLABUS

Course name
Autonomous mobile robots [S2AiR2-RiSA>ARM]

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/2

Area of study (specialization)
Autonomous Robots and Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

prof. dr hab. inż. Piotr Skrzypczyński
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Lecturers

Prerequisites

tudent starting this course should have extended knowledge of programming practice, architecture of computer systems and operating systems, robotics and artificial intelligence. He should also have the ability to obtain information from the indicated sources.

Course objective

The aim of the course is to familiarize yourself with the issue of autonomous mobile robots and their applications in industry and services, and use the experience as a field for artificial intelligence methods.

Course-related learning outcomes

Knowledge:
K2_W2 has structured and in-depth knowledge of artificial intelligence methods and their applications in automation and robotics systems;, K2_W25 has knowledge of running a business, engineering project management and quality management;, K2_W6 has detailed knowledge of the construction and use of advanced sensory systems;

Skills:

K2_U12 can integrate and program specialized robotic systems;K2_U25 will be able to construct an algorithm to solve a complex and unusual engineering task and a simple research problem, as well as implement, test and run it in a selected programming environment for selected operating systems;K2_U26 is able to construct an algorithm for solving a complex measuring and computing-control task and implement, test and run it in a selected programming environment on a microprocessor platform;
K2_U22 is able to critically evaluate and select appropriate methods and tools to solve of automation and robotics; is able to use innovative and unconventional tools unconventional tools in the field of automation and robotics;

Social competences:
K2_K4 is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which devices and their components can function;

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written examination (theoretical knowledge test) in the field of lining issues]: concepts, methods, algorithms.Laboratory: examining the practical skills of programming selected types of mobile robots and their components, carry out experiments, evaluate the reports.

Programme content

Lecture. Various issues associated with the construction, operation and use of autonomous vehicles. Construction and operation of mobile robots driving systems. Walking robots. Sensory systems. Architecture of mobile robots navigation systems. Basic issues of autonomous navigation (map building, localization, path planning). Applications of mobile robots. SLAM methods.Laboratory. Simple wheeled robot control algorithms. The processing of information from external sensors. Build a model of the environment - examples. Implementation of the control reflex. Navigation issues - implementation of self-localization algorithms. SLAM algorithms, deep learning tools.

Course topics

Lecture. Various issues associated with the construction, operation and use of autonomous vehicles. Construction and operation of mobile robots driving systems. Walking robots. Sensory systems. Architecture of mobile robots navigation systems. Basic issues of autonomous navigation (map building, localization, path planning). Applications of mobile robots. SLAM methods.Laboratory. Simple wheeled robot control algorithms. The processing of information from external sensors. Build a model of the environment - examples. Implementation of the control reflex. Navigation issues - implementation of self-localization algorithms. SLAM algorithms, deep learning tools.

Teaching methods

. Lecture: multimedia presentation, illustrated with examples2. Laboratory exercises: carrying out the tasks given by the teacher - practical exercises

Bibliography

Basic:
33. S. Thrun, D. Fox, W. Burgard, Probabilistic Robotics, MIT Press, Cambridge, 3
53. I. Nourbakhsh, R. Siegwart, D. Scaramuzza, Introduction to Autonomous Mobile Robots, MIT Press, Cambridge, 3
333. P. Skrzypczyński, Metody analizy i redukcji niepewności percepcji w systemie nawigacji robota mobilnego, Wyd.PP, Poznań, 3
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Additional:
1. R. Murphy, Introduction to AI Robotics, 2nd Edition, MIT Press, 2019 2. J. Borenstein, H. R. Everett, L. Feng, Where am I? Sensors and methods for mobile robot positioning, University of Michigan,19963. A. Borkowski, R. Chojecki, M. Gnatowski, W. Mokrzycki, B. Siemiątkowska, J. Szklarski, Reprezentacja

otoczenia robota mobilnego, EXIT, Warszawa, 2011.4. J. Będkowski, Qualitative Spatio-Temporal Representation and Reasoning for Robotic Applications, EXIT. Warszawa, 2015

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50