COURSE DESCRIPTION CARD - SYLLABUS

Course name
Research project

Course

Field of study
Automatic Control and Robotics
Area of study (specialization)
Control and Robotics Systems
Level of study
Second-cycle studies
Form of study
full-time

Year/Semester
1 / 2
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

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

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Dariusz Pazderski

email: dariusz.pazderski@put.poznan.pl

tel. 61 665 2100

Faculty of Control, Robotics and Electrical Engineering

ul.Piotrowo 3a, 60-965 Poznań

Responsible for the course/lecturer:
dr inż. Piotr Dutkiewicz

email: Piotr.Dutkiewicz@put.poznan.pl

tel. 61 6652368

Faculty of Control, Robotics and Electrical Engineering

ul.Piotrowo 3a, 60-965 Poznań

Prerequisites

Knowledge: Student starting this module should have basic knowledge regarding robotics, measurement systems and microcontrollers, neuro-fuzzy control, control theory, robot programming and task planning.

Skills: He/she should have skills allowing solving basic problems related to solve basic problems in the field of linear systems (description in the state space, control feedback, feedforward, linearization) and non-linear systems and the ability to obtain information from indicated sources. He should also understand the need to broaden his competence.

Social competencies: In addition, in respect to the social skills the student should show attitudes as honesty, responsibility, perseverance, curiosity, creativity, manners, and respect for other people.

Course objective

1. Practical use and consolidation of the student's knowledge in the field of control systems and control and measurement systems as well as analysis and synthesis of selected control systems on the basis of an independently solved research problem in the field of automation and robotics.

2. Developing in students the ability to independently solve the problem posed by the issues from the first point.

3. Developing in students the ability to share conclusions with the group and the ability to communicate the results of research work in an appropriate way.

Course-related learning outcomes

Knowledge

1. Has extended knowledge in selected areas of robotics and automation - [K2_W10].

2. Has theoretically underpinned detailed knowledge related to control and measurement systems - [K2_W11]

3. Has knowledge of development trends and the most important new developments in the field of automation and robotics and related scientific disciplines - [K2_W12]

4. Knows and understands the basic concepts and principles of intellectual property and copyright protection; can use patent information resources - [K2_W16].

Skills

1. Is able to critically use literary information, databases and other sources in Polish and foreign languages - [K2_U1]

2. Can analyze and interpret technical design documentation and use scientific literature related to a problem that needs to be solved on its own - [K2_U2]

3. He/she can prepare a scientific study in his/her mother tongue and a short scientific report in English presenting the results of his/her own scientific research - [K2_U4].

4. Is able to prepare and deliver, in Polish and in a foreign language, an oral presentation on the results of his/her work (including research) as defined by the project task – [K2_U5]

5. Possesses self-education skills to improve and update professional competence - [K2_U6]

6. Can formulate and verify (simulatively or experimentally) hypotheses related to engineering tasks and simple research problems in the field of automation and robotics - [K2_U15]

7. Can assess the usefulness and applicability of new developments (including techniques and technologies) in the field of automation and robotics - [K2_U16].

Social competences

1. He is aware of the necessity of a professional approach to technical issues, scrupulous familiarization with the documentation and environmental conditions in which the equipment and its components can operate - [K2_K4].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative assessment:

based on the evaluation of the current progress of the project-research task

Total assessment:

within the scope of the project, the verification of the assumed educational results is carried out by:

i. evaluation of the student's preparation for particular project sessions and evaluation of skills related to the realization of the project-research task,

ii. continuous assessment, in each class (oral answers) and bonus the increase in the ability to use the learned principles and methods,

iii. evaluation of the functioning of simulation programs prepared partly during and partly after classes; this evaluation also includes the ability to work in a team,

iv. assessment of knowledge and skills related to the implementation of the project-research task on the basis of the prepared and presented presentation on the group forum,

v. Student's assessment and defense of the report on the realization of an independently performed project-research task,

Additional elements cover:

i. discussing additional aspects of the issue,

ii. effectiveness of applying the acquired knowledge while solving a given problem,

iii. the ability to cooperate within a team practically carrying out a specific task in the laboratory,

iv. Identifying students' perception difficulties enabling ongoing improvement of the didactic process.

Programme content

The research project is conducted during fifteen 2-hour meetings. Each project is carried out by 2-person teams of students. Issues that are in the area of interest and problems posed to the student teams concern the practical use of knowledge and skills acquired in this field. The projects may also have a research character. Each team receives a task to be solved. The topics of the projects include automation and robotics: algorithms and control systems of robots and their application, planning robot movement in simulation environments, e.g. Matlab/Simulink or in high level programming language C/C++, laboratory tests of selected algorithms and control methods on real objects, modeling of kinematics and dynamics of non-linear holonomous and nonholonomous systems, control and measurement systems in automation and robotics, including vision systems with the use of microcontrollers and DSP processors. In the course of the classes, students must properly analyze and interpret possible technical design documentation and/or make proper use of the scientific literature related to the problem. At the end, each team must prepare and present in Polish or in a foreign language a multimedia presentation on the results of the team's research work or a description of the stages of the project task of an engineering nature.

Teaching methods

1. Project labs: performing simulation and hardware experiments, discussion, working in a two-person team, multimedia show, demonstration of the operation of the control system and/or its measuring systems, solving practical problems by teams.

Bibliography

Basic

1. Wprowadzenie do robotyki. Mechanika i sterowanie, J.J. Craig, WNT Warszawa, 1993.

2. Dynamika i sterowanie robotów, M.W. Spong, M. Vidyasagar, WNT, Warszawa 1997.

3. Manipulatory i roboty mobilne. Modele, planowanie ruchu, sterowanie, K. Tchoń, A. Mazur, I. Dulęba, R. Hossa, R. Muszyński, Akademicka Oficyna Wydawnicza, Warszawa, 2000.

4. Modelowanie I sterowanie robotów, K. Kozłowski, P. Dutkiewicz, W. Wróblewski, Wydawnictwo Naukowe PWN, Warszawa, 2003..

Additional

1. Modeling and Control of Robot Manipulators, Sciavicco, B. Siciliano, Springer-Verlag, London, 2000.

2. B. Siciliano, O. Khatib (Ed.), Handbook of Robotics, Springer 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2
Classes requiring direct contact with the teacher	33	1
Student's own work (literature studies, preparation for project classes, preparation for the final test, project preparation) [1]	22	1

1 delete or add other activities as appropriate