POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Control of nonlinear processes [N2AiR1-ISA>PO1-SPN]

Course

Field of study	Year/Semester
Automatic Control and Robotics	1/2
Area of study (specialization)	Profile of study
Intelligent Control Systems	general academic
Level of study	Course offered in
second-cycle	Polish
Form of study	Requirements
part-time	elective

Number of hours

Lecture	Laboratory classes	Other
10	20	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

3,00

Coordinators	Lecturers
dr inż. Joanna Ziętkiewicz joanna.zietkiewicz@put.poznan.pl	

Prerequisites

Every student attending the subject is expected to have basic knowledge from the fields: automatic control and control theory. In particular, the student should be able to analyse a linear dynamical process and design basic control system for it.

Course objective

To provide students with the knowledge of the nonlinear systems behaviour and with the skills of analising such systems. To familiarise students with the most improtant approaches to control algorithms design for nonlinear processes.

Course-related learning outcomes

Knowledge
[K2_W5]
[K2_W_3]
[K2_W10]
Skills
[K2_U10]

[K2_U12]
[K2_U21]
[K2_U27]
Social competences
[K2_K4]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The knowledge gained during lectures is veryfied by the final test consisting of 20-40 closed questions.
The skills acquired during laboratory classes is verified by: written tests, knowledge and skills assessment during excersises made by students, evaluation of the reports, which are prepared individually by students.

Programme content

Examples of nonlinear processes. Nonlinear phenomena. Stability analysis using graphical and analytical methods. Mimimum phase and non-minimum phase processes. Controllability and observability in nonlinear systems. Feedback linearization. Control methods relying on feedback linearization and the problem of constraints. Discretization of nonlinear models. Methods relying directly on a model and a specified optimization task: predictive control methods; selected ways to solve the optimization problem. Introduction to other selected approaches used in nonlinear control system design, inluding: sliding mode control, Lapunov redesign, backstepping method.

Course topics

Teaching methods

1. Lectures: interactive presentation supplemented by examples calculated on the blackboard. Students are encouraged to active participation in the classes.
2. Laboratory classes: practice excercises performed by students on computers, according to the instruction given by a teacher. Students are encouraged to independent thinking, analysis and solving problems arising in nonlinear process control.

Bibliography

Basic
1. Kurowski, T., Siergiej T., Wybrane zagadnienia teorii układów liniowych i nieliniowych, Uniwersytet Zielonogórski 2003
2. Khalil H. K., Nonlinear Systems, Prentice Hall, 2002
3. Isidori A., Nonlinear control systems, Springer Verlag, 1995
Additional
1. Slotine J.-J. E., Li W., Applied nonlinear control, Prentice Hall, 1991
2. Strogatz S. H., Nonlinear dynamics and chaos, Addison-Wesley Publishing Company, 1994
2. Bequette B. W., Process control. Modeling, design and simulation, Prentice Hall, 2002
3. Maciejowski J. M., Predictive control with constraints, Prentice Hall, 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50