COURSE DESCRIPTION CARD - SYLLABUS

Course name

Control of nonlinear processes

Course

Field of study

automatic control and robotics

Area of study (specialization)

intelligent control systems

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1 / 2

Profile of study

general academic

Course offered in

polski

Requirements

elective

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:

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Wydział Automatyki, Robotyki i Elektrotechniki

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Responsible for the course/lecturer:

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:

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.

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	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/final test, reports preparation) [1]	40	1,5

[1] delete or add other activities as appropriate