Continous process control - course description

General information

Course name	Continous process control
Course ID	06.9-WE-AutP-ContProcCont-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Automatic Control and Robotics
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2022/2023

Course information

Semester	5
ECTS credits to win	4
Course type	obligatory
Teaching language	english
Author of syllabus	• dr hab. inż. Wojciech Paszke, prof. UZ

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Laboratory	30	2	-	-	Credit with grade

Aim of the course

1. To familiarize with the basic techniques of designing continuous process control systems

2. To develop understanding of state-of-the-art control techniques

3. To develop understanding of the techniques of designing the state observer and its applications

Prerequisites

Control Engineering , Signals and Dynamic Systems, , Modelling and Simulation, Linear Algebra with Analytic Geometry

Scope

System analysis. Elementary definitions and properties. System definition. Input-output representation. State-space representation. Elementary variables associated with the system being analysed. General concepts of control. Practical applications.

Continuous-time systems. Properties and computer implementations. Typical realisations of continuous-time systems. Input-output representation.
State-space representation. Computer-based implementation of linear and non-linear systems.

Discrete-time systems. Properties and computer implementations. Typical realisations of discrete-time systems. Input-output representation.
State-space representation. Computer-based implementation of linear and non-linear systems.

Analysis of systems described by state-space equations. Structures of the matrices of linear systems. Stability. Observability. Controllability. Computer-based analysis of the above properties. Practical interpretation of stability, observability and controllability.

Design of control systems with output feedback. Rules for designing control systems described by state-space equations with output feedback. Computer-based design techniques. Practical applications.

Design of control systems described by state-space. Rules for designing control systems described by state-space equations with state-feedback. Computer-based design techniques. Separation principle. Practical applications.

Observers. Luenberger observer. Computer-based design techniques and convergence analysis. Practical implementations.

Teaching methods

lecture: classical lecture,

laboratory: laboratory exercises, projects carried out in two-person group.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
To know how to implement the system modesl using modern engineering tools		• an ongoing monitoring during classes	• Laboratory

Outcome description	Outcome symbols	Methods of verification	The class form
To have the ability to implement systems in the state space		• an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Laboratory
To have elementary skills in the implementation of control systems with state and output feedbacks		• a quiz • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Laboratory
To understand the need for a mathematical description of the system in the form of state space equations		• an exam - oral, descriptive, test and other	• Lecture
Has elementary knowledge on designing of control systems described by the state space models		• a quiz • an ongoing monitoring during classes	• Laboratory

Assignment conditions

Recommended reading

1. Dorf, R. i Bishop, R. (2011). *Modern Control Systems*, Prentice Hall, New Jersey.
2. Astrom, S. i Murray, R. (2010). *Feedback systems: An introduction for scientists and engineers*, Princeton University Press, Princeton and Oxford.
3. Nise, N. (2011). *Control Systems Engineering*, Wiley, New Jersey

Further reading

Notes

Modified by dr hab. inż. Wojciech Paszke, prof. UZ (last modification: 11-04-2022 09:05)