Advanced control systems and computer networks - course description

General information

Course name	Advanced control systems and computer networks
Course ID	06.2-WE-ELEKTD-ACSandCN- SPiE-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	Second-cycle Erasmus programme
Beginning semester	winter term 2017/2018

Course information

Semester	2
ECTS credits to win	6
Course type	optional
Teaching language	english
Author of syllabus	• prof. dr hab. inż. Igor Korotyeyev

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	-	-	Credit with grade
Laboratory	15	1	-	-	Credit with grade
Project	15	1	-	-	Credit with grade

Aim of the course

- familiarize students with control techniques of bases power converters

- familiarize students with bases of control with help of neural networks

- shaping basic skills for selection and adjust of parameters under using of standard control strategy of power converters

- formation among the students understanding of control problems, monitoring and diagnostic of distributed systems

Prerequisites

Selected issues of circuit theory I and II

Scope

Voltage regulation techniques. Method of identification of basic harmonic. Integrated methods. Momentary power theory p-q – bases. Momentary power theory in orthogonal coordinates. Control techniques of power flow. Variable structure control. Phase space method. Methods of variable structure construction. Idea of generation of induced motions. Conditions of existence of sliding mode.

Neural networks. Unidirectional networks. Recurrent networks. Teaching neural networks methods. Backpropagation algorithm. Neural networks in adaptive system. Neural control system.

Fuzzy control. Fuzzy control models. Fuzzy control in industry. Systems based on knowledge about processes. Controller based on knowledge (KBC). Knowledge presentation in controller KBC. Adaptive control systems. Adaptive mechanism. Operation estimation.

Adaptive control systems for static object. Self-organized regulator. Regulator based on model. Optimal control. Dynamical optimization conception. The principle of maximum. Control at minimum expense. Technical implementation of the optimum control system.

Computer Networks. OSI model. Local computer networks. Equipment and signals of the first layer of the OSI model. Media, connections, and collisions in the first layer of the OSI model. The second layer of the OSI model - the basics. Secondary OSI model technologies. Design and documentation of computer networks. Structural cabling. Addressing on computer networks. Routing and routed protocols. OSI model transport layer. Session layer of the OSI model. Presentation layer of the OSI model. Application layer model OSI.

Teaching methods

Lecture, laboratory exercises, project

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Can configure communication devices in local and wide area networks		• a quiz	• Laboratory

Outcome description	Outcome symbols	Methods of verification	The class form
Can to design electronic systems and systems for a wide variety of applications, including high frequency systems and digital signal processing systems.		• a quiz	• Laboratory
Knows and understands advanced artificial intelligence methods used in the design of electronic systems and systems.		• an evaluation test	• Lecture
Understands the need for advanced control strategies for power converters		• a quiz	• Lecture
Has detailed knowledge of control and automation basics		• an evaluation test	• Lecture

Assignment conditions

Lecture – obtaining a positive grade in written exam.

Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Calculation of the final grade: lecture 40% + laboratory 30% + project 30%

Recommended reading

1. Kevin Gurney. An Introduction to Neural Networks. CRC Press, 2003 - 234

2. Hingorani N., Gyugyi L.: Understanding FACTS. Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, New York, 2000.

3. Song Y., Johns A.: Flexible AC Transmission Systems (FACTS), IEE Power and Energy Series 30, TJ International Ltd, Padstow, Cornwall, 1999.

Further reading

1. Jeff Doyle, Jennifer DeHaven Carroll. Routing TCP/IP, Volume 1, 2nd Edition. Cisco Press. 2005

2. Vito Amato; Wayne Lewis. Cisco Networking Academy Program: First-Year Companion Guide. Cisco Systems, 2000.

Notes

Modified by dr hab. inż. Radosław Kłosiński, prof. UZ (last modification: 27-04-2017 08:36)