COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fundamentals of Control Theory for Power Engineers

Course

Field of study

Electric Power Engineering

Area of study (specialization)

common courses

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

summer

Profile of study

general academic

Course offered in

english

Requirements

compulsory

Number of hours

Lecture

10

Tutorials

Laboratory classes

10

Projects/seminars

10

Other (e.g. online)

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Andrzej Kwapisz, Ph. D., Eng.

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Responsible for the course/lecturer:

Prerequisites

Has knowledge about mathematics and selected physics sections (optics, mechanics, electricity, magnetism). Has knowledge about signal theory and methods of it's processing in time and frequency domain.

Is able to describe selected physical phenomena with mathematical apparatus.

Is able to approve himself in new knowledge acquisition.

Course objective

Getting knowledge about basic automatics components, automatic system and regulation, knowledge of regulator selection and it's parameters adjustment for different types of regulation objects. Knowledge about synthesis methods and analysis of continuous automatic systems with application of different analytic methods and numerical modeling.

Course-related learning outcomes

Knowledge

1. Has general knowledge about use and operation of automatic systems.

2. Knows the structure and principle of operation of control systems applicable in controlling energy processes.

3. Has basic knowledge about the basics of automation and automatic control.

Skills

1. He can choose the right elements for the built system based on catalog data.

2. Is able to identify the basic elements of automation and automatic control systems based on their special features and carry out the synthesis and analysis of simple automatic control systems.

3. Is able to use software tools for testing the properties of automation systems, including for testing stability of systems.

4. Is able to present the results obtained in an understandable way.

Social competences

1. Is aware of the significant impact of engineering and automatic control systems on the environment.

2. Understands the need for continuous professional development, personal and group cooperation.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
Lecture: assessment of activity in class, assessment of homework, final test in writing at the end of the semester, colloquium includes test questions or problem tasks, written exam covering the subject of the subject assessed on a scale of 0 to 100%, the final grade lectures given by more than one lecturer based on weighted average, final grade for more than one component grade based on weighted average

Laboratory: verification of individual preparation for classes, including material from a single exercise or block of exercises, assessment of individual exercise reports made by the student, colloquium at the end of the semester, colloquium includes test questions or problem tasks, all grades on a scale of 0 to 100%, final grade based on the weighted average of all component ratings

Programme content

Lecture

Basic concepts of control theory, division of automation systems. Mathematical description of linear control systems, operator and spectral transmittance, examples. Description of control systems in the space of variable states. Properties of basic automation elements. Time and frequency characteristics. Block diagrams of automatic control systems, transformation of block diagrams. Regulator properties, selection of settings, examples. Stability of continuous linear systems, general stability conditions, algebraic and graphic criteria. Nonlinear elements in control systems. Control quality, static accuracy, description of dynamic properties of systems.

Laboratory

Step and impulse responses of basic automation elements, frequency characteristics, transformation of block diagrams, construction of control and regulation systems, selection of controller settings, two-position and cascade regulation, examination of regulation quality, examination of interference affecting the object and regulation system. The use of digital modeling for the analysis of automation systems, the use of publicly available programs for the study of control systems.

Project

Develop of control system for a selected plant, design a controller, build computer model of a system, analysis of it’s stability and behavior.

Teaching methods

Lecture: multimedia and interactive presentation presenting important issues related to the subject, didactic discussion based on the literature on the subject, informative lecture, problem lecture, case study, work on source materials

Laboratory: implementation of exercises, use of publicly available information and software tools to support the didactic process, encouraging students to independently search for optimal solutions and problem solving

Project: selection of tools for the task, implementation and description of the project task, including the development of an original system, application or algorithm, problem discussion, searching for optimal solutions

Bibliography

Basic

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2. Dębowski A., Automatyka - Podstawy teorii, WNT 2008

3. Findeisen W., Technika regulacji automatycznej, PWN 1978

4. Kowal J., Podstawy automatyki. Tom I, UWND AGH Kraków 2004

5. Kowal J., Podstawy automatyki. Tom II, UWND AGH Kraków 2004

6. Mazurek J. Vogt H. Żydanowicz W., Podstawy automatyki, OWPW 2002

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Additional

1. Byrski W., Obserwacja i sterowanie w systemach dynamicznych, UWND AGH Kraków 2007

2. Dorf R.C. Bishop R.H., Modern Control Systems, Upper Saddle River: Prentice Hall, 2001

3. Nise N.S., Control System Engineering. 3th edition, John Wiley & Sons, 2000

4. Ogata K., Modern Control Engineering. 4th edition, Prentice Hal 2002

5. Amborski K., Marusak A. Teoria sterowania w ćwiczeniach, PWN 1978

6. Baron K. Latarnik M. Skrzywan-Kosek A. Świerniak A., Zbiór zadań z teorii liniowych układów regulacji, WPŚ 1999

7. Holejko D. Kościelny W. Niewczas W., Zbiór zadań z podstaw automatyki, OWPW 1985

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10. Próchnicki W., Dzida M. Zbiór zadań z podstaw automatyki, WPG 1993

11. Horla D., Podstawy automatyki. Ćwiczenia rachunkowe. Część 1, WPP, 2014

Breakdown of average student's workload

	Hours	ECTS
Total workload	123	5
Classes requiring direct contact with the teacher	45	2
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, preparation of lab reports, implementation of the project) [1]	78	3

1 delete or add other activities as appropriate