COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of control engineering [N1Energ2>PA]

Course

Field of study
Power Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
10

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Andrzej Kwapisz
andrzej.kwapisz@put.poznan.pl

Lecturers

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 knowledge of controlling the course of dynamic phenomena occurring in power systems.
2. Has general knowledge of the structure and functioning of automation and automatic control systems.

3. Has knowledge of the assessment and selection of parameters of the regulation process and the assessment of its stability.
4. Knows the structure and principles of operation of control systems used to control power processes and systems.
5. Has knowledge of calculation methods and simulations of phenomena occurring in control systems.

Skills:
1. Is able to select appropriate elements for the system being built based on catalog data.
2. Is able to identify the basic elements of automation and automatic control systems based on their specific features and to synthesize and analyze simple automatic control systems.
3. Is able to use software and simulation tools to test the properties of automation systems, including testing the stability of the systems.
4. Is able to build a model of an automation system and interpret the obtained results.

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 during classes, assessment for completed homework, written colloquium at the end of the semester, colloquium including test questions and problem tasks, assessed on a point scale from 0 to 100%, final assessment for lectures conducted by more than one lecturer based on weighted average, final grade for more than one component grade based on the weighted average. Passing from 60% of points obtained.
Laboratory: verification of individual preparation for classes, including material from a single exercise or block of exercises, assessment of individual reports on exercises prepared by the student, test at the end of the semester, test questions or problematic tasks, all grades on a point scale from 0 to 100%, final grade based on the weighted average of all component grades. Passing from 60% of obtained points.

Programme content

Basics of control theory, dynamic elements and systems, control systems - structure, operation and application.

Course topics

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 state variables. Properties of basic automation elements. Time and frequency characteristics. Block diagrams of automatic control systems, transformation of block diagrams. Properties of controllers, selection of settings, examples. Stability of linear continuous systems, general stability conditions, algebraic and graphic criteria. Nonlinear elements in control systems. Quality of regulation, static accuracy, description of dynamic properties of systems. Control systems, disturbances in control systems, disturbance compensators.
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.

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

Bibliography

Basic:
1. Brzózka J., Regulatory i układy automatyki, MIKOM 2004
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
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6. Mazurek J. Vogt H. Żydanowicz W., Podstawy automatyki, OWPW 2002
7. Rumatowski K., Podstawy automatyki. Część 1. Układy liniowe o działaniu ciągłym, WPP 2004
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1. Byrski W., Obserwacja i sterowanie w systemach dynamicznych, UWND AGH Kraków 2007
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11. Horla D., Podstawy automatyki. Ćwiczenia rachunkowe. Część 1, WPP, 2014
12. Kwapisz A., Adaptacyjne układy automatyki samoczynnego częstotliwościowego odciążania w sieciach elektroenergetycznych - korzyści i bariery, Bezpieczeństwo energetyczne : rynki surowców i energii, 2014

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00