COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of control engineering [N1Energ1>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 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:

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.

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

5. Kowal J., Podstawy automatyki. Tom II, UWND AGH Kraków 2004
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
8. Rumatowski K., Podstawy regulacji automatycznej, WPP 2008
9. Węgrzyn S., Podstawy automatyki, PWN 1980
10. Zabczyk J., Zarys matematycznej teorii sterowania, PWN 1991
11. Żelazny M., Podstawy automatyki, PWN 1976
12. Horla D., Podstawy automatyki. Ćwiczenia laboratoryjne, WPP, 2014
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
8. Horla D, Podstawy automatyki - ćwiczenia laboratoryjne, WPP 2009
9. Mrozek B. Mrozek Z., Matlab i Simulink. Poradnik użytkownika. Wydanie II, HELION 2004
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	96	3,00
Classes requiring direct contact with the teacher	42	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	54	2,00