STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Basics of control engineering		**1010311431010310177**
Field of study: **Power Engineering**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **2 / 3**
Elective path/specialty: **-**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **30** Classes: **-** Laboratory: **15** Project/seminars: **-**		No. of credits: **3**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has knowledge about mathematics and selected phisics sections (optisc, mechanics, electricity, magnetism). Has knowledge about signal theory and methods of it's processing in time and frequency domain.
2	**Skills**	Is able to describe selected physical phenomena with mathematical apparatus
3	**Social competencies**	Is able to approve himself in new knowledge aquisition

Assumptions and objectives of the course:

Getting knowledge about basic automatics components, automatic system and regulation, knowledge of regulator selection and it's parametrers 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.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has general konwledge about use and operation of automatic systems. - [K_W01 +++, K_W02 +++, K_W22 +++]
2. Has knowledge about control systems used in electrical power engineering. - [K_W03 ++, K_W11 ++, K_W18 ++]
3. Knows and understands the significance of automatic electrical power control systems for country energy safety - [K_W07 +, K_W08 +]

Skills:

1. Is able to identify basic automatic components and automatic control systems on the basis of its specific features. - [K_U07 +++, K_U09 +++, K_U10 +++]
2. Is able to use software tools for research of automatic system features and it - [K_U12 +++, K_U13 +++, K_U22 +++]
3. s able to design and evaluate the results of a simple automatic control system operation - [K_U02 +++, K_U04 +++, K_U05 +++]

Social competencies:

1. Is aware of the significant impact of engineering and automatic control systems on the environment - [K_K02 +++]
2. Understands the need for continuous professional development, personal and group cooperation - [K_K01 +++]

Assessment methods of study outcomes

Lecture
evaluation of the knowledge and skills based on exam.
Laboratory:
tests and written tests,
evaluation of knowledge and skills related to the accomplishment practice task,
evaluation of report from performed exercise.
Obtainment of extra points for the activity in the classroom, in particular for:
effectiveness of the application of acquired knowledge during studies,
ability to work within a team performing the detailed practice task in the laboratory,
contribution to the achievement of the tasks.

Course description

Basic concepts of control theory, the division of control systems. Mathematical description of linear control systems, transfer and spectral function, examples. Description of the control system state variables. Properties of the basic elements of automation. Time and frequency characterisctis. Block diagrams of automatic control systems, flowchart conversion. Properties of regulators, tuning and examples. The stability of continuous linear systems, the general conditions of stability, algebraic and graphical criteria. Correction in control systems. Linear discrete systems, system stability. Nonlinear systems (static characteristics, dynamics analysis methods, examples). Quality of control, static accuracy, description of the properties of dynamic systems. Interactive lectures, stimulating students to actively participate in classes, presentation of practical approach to theoretical problem solving, activating the student's self-reliance in expanding knowledge through additional tasks, supplementing the content with attractive visual addons, activating self-problem solving by the student during a classes, teaching support through wide use of open license software, encouraging alternative sources for self-improvement of knowledge and skills by the student, learning to use individual skills in teamwork, encourage students to independently design equipment, develop experiments and develop programming and go beyond the study program.

Basic bibliography:

1. Brzózka J., Regulatory i układy automatyki, MIKOM 2004
2. Byrski W., Obserwacja i sterowanie w systemach dynamicznych, UWND AGH Kraków 2007
3. Dębowski A., Automatyka - Podstawy teorii, WNT 2015
4. Dorf R.C. Bishop R.H., Modern Control Systems, Addison - Wesley & Sons, 1998
5. Findeisen W., Technika regulacji automatycznej, PWN 1969
6. Kowal J., Podstawy automatyki. Tom I, UWND AGH Kraków 2004
7. Kowal J., Podstawy automatyki. Tom II, UWND AGH Kraków 2004
8. Mazurek J. Vogt H. Żydanowicz W., Podstawy automatyki, OWPW 2002
9. Nise N.S., Control System Engineering. 3th edition, John Wiley & Sons, 2000
10. Ogata K., Modern Control Engineering. 4th edition, Prentice Hal 2002
11. Rumatowski K., Podstawy automatyki. Część 1. Układy liniowe o działaniu ciągłym, WPP 2004
12. Rumatowski K., Podstawy regulacji automatycznej, WPP 2008
13. Węgrzyn S., Podstawy automatyki, PWN 1976
14. Zabczyk J., Zarys matematycznej teorii sterowania, PWN 1991
15. Żelazny M., Podstawy automatyki, PWN 1976

Additional bibliography:

1. Amborski K., Marusak A. Teoria sterowania w ćwiczeniach, PWN 1978
2. Baron K. Latarnik M. Skrzywan-Kosek A. Świerniak A., Zbiór zadań z teorii liniowych układów regulacji, WPŚ 1999
3. Holejko D. Kościelny W. Niewczas W., Zbiór zadań z podstaw automatyki, OWPW 1985
4. Horla D, Podstawy automatyki - ćwiczenia laboratoryjne, WPP 2009
5. Mrozek B. Mrozek Z., Matlab i Simulink. Poradnik użytkownika. Wydanie II, HELION 2004
6. Próchnicki W., Dzida M. Zbiór zadań z podstaw automatyki, WPG 1993

Result of average student's workload

Activity	Time (working hours)

1. participation in class lectures	30
2. participation in laboratory classes	15
3. participate in the consultations on the lecture	5
4. participate in the consultations on the laboratory	5
5. preparation laboratory reports	7
6. prepararion to the laboratory classes	7
7. preparation of home work	5
8. preparation for the completion of laboratory	3
9. completion of laboratory classes	2
10. preparation for the exam	7
11. the exam	3
12. student`s selfmanaged work	7

Student's workload

Source of workload	hours	ECTS
Total workload	96	3
Contact hours	60	2
Practical activities	45	1