STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Control of power electronic systems**		Code **1010322331010322707**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **Microprocessor Control Systems in**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **15**		No. of credits **5**
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 **technical sciences** **Technical sciences**		ECTS distribution (number and %) **5 100%** **5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	It knows mechanisms of action of power electronics systems , the theory of the control and the rule of the mathematical modeling
2	**Skills**	It knows to apply the knowledge from the range of power electronics systems, the theory of the control and the rule of the mathematical modeling
3	**Social competencies**	It can think and work enterprisingly in the area of the designing of the software for microprocessor systems , controls of systems and the mathematical modeling

Assumptions and objectives of the course:

The introduction with methods and control systems(open and closed) , with targeting the formation of given sizes of output quantity power electronics systems. The introduction with methods of the description, the analysis, the synthesis and the optimization of power electronics systems

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

Knowledge:

1. to circumscribe mechanisms of action and to apply tools of the analyses and the synthesis of the theory of the control to the analysis, the optimization and the designing of analog and digital control systems of power electronics systems - [K_W04 ++ K_W14 +++]

Skills:

1. to apply tools of the analyses and the synthesis of the theory of the control to the analysis, the optimization and the designing of analog and digital control systems of power electronics systems - [K_U01 + K_U15+++]

Social competencies:

1. it can think and work enterprisingly in the area of the designing of algorithms of the digital signal processing, the control of power electronics systems and the mathematical modeling - [K_K01 ++ K_K02 ++]

Assessment methods of study outcomes

Lecture

? the credit of the lecture preceded with the credit of occupations laboratory exercises

Designing work and laboratory exercises:

? the test and awarding the knowledge of need-to-know to realization of placed problems

in the given area of tasks,

? verification skills on every exercises

? evaluation of the knowledge and skills related to the realization of laboratory exercise, the evaluation of the report from done exercises.

Obtaining additional points for activity during exercises, in particular way for:

? proposing to discuss additional aspects of the subject

? effective use of knowledge obtained during solving of given problem;

? comments related to improve teaching material,

? aesthetics of solved problems and reports ? within homework.

Course description

Methods of the formations of output quantity in power electronics systems, in structures open and closed. Methods and properties of the control with the modulation of the width of impulses (PWM). The general characteristics of intelligent modules of the power (IPM). The systemic realization of courses modulated (PWM). Apply of adaptive methods in the control of power electronics systems. Tasks and methods of the identification and the control room realized by adaptive filters Wienera, the filter Kalman and neural networks. Methods of the fractional control. Examples of the control of chosen power electronics systems.

Basic bibliography:

1. TUNIA H., SMIRNOW A., NOWAK M., BARLIK R., Układy energoelektroniczne. Obliczanie, modelowanie, projektowanie, WNT, Warszawa 1982.

2. TUNIA H., BARLIK R., Teoria Przekształtników, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2003.

3. BUBNICKI Z.: Teoria i algorytmy sterowania. PWN, Warszawa 2002.

4. NIEDERLIŃSKI A., MOŚCIŃSKI J., OGONOWSKI Z.: Regulacja adaptacyjna. PWN, Warszawa, 1995.

5. RUTKOWSKI L.: Filtry adaptacyjne i adaptacyjne przetwarzanie sygnałów. WNT, Warszawa 1994

Additional bibliography:

1. NOWAK M., BARLIK R.: Poradnik inżyniera energoelektronika. WNT, Warszawa 1998.

2. KAŹMIERKOWSKI M., KRISHNAN R., BLAABERG H.: Control in Power Electronics, Academic Press, Amsterdam 2002.

3. WĘGRZYN S.: Podstawy automatyki. PWN, Warszawa 1972.

4. WÓJCIAK A.: Mikroprocesory w układach przekształtnikowych, WNT Warszawa 1992.

Result of average student's workload

Activity	Time (working hours)
1. participation in the lectures	30
2. participation in the laboratory and designin exercises	30
3. participation in consultations on the lecture	10
4. participation in consultations on the laboratory and designin exercises	10
5. preparation for the laboratory and designin exercises	10
6. preparation for the exam	10
7. preparation for the laboratory exercises pass	15
8. participation in the exam	5

Student's workload

Source of workload	hours	ECTS
Total workload	120	5
Contact hours	80	3
Practical activities	30	3