COURSE DESCRIPTION CARD - SYLLABUS

Course name

Control of power electronics systems

Course

Field of study	Year/Semester
Electrotechnics	1/1
Area of study (specialization)	Profile of study
Microprocessor Control Systems in Electrical Engineering	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
full-time	elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:	Responsible for the course/lecturer:
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Prerequisites

The student starting this subject should have a basic knowledge of the basics of programming, power electronics and control. He should also be able to obtain information from specified sources and be willing to cooperate as part of a team.

Course objective

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

Course-related learning outcomes

Knowledge

1. Student has detailed knowledge of power electronics devices (power structures and control systems).

2. Student has knowledge of the principles of design and implementation of power electronics devices (simulation models, calculations of states in the system).

3. Student has knowledge of physical structures and controls used in modern power electronics devices.

Skills

1. Student has the ability to design and build simple power electronics systems using at least one of the most popular power and control systems.

2. Student is able to operate simulation programs used in power electronics.

Social competences

1. The student understands that knowledge and skills in the field of control in power electronics is widely used in most of the electrical devices used.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

Programme content

Methods of shaping the given output values in power electronic systems, in open and closed structures. Methods and properties of pulse width modulation (MSI) control. General characteristics of Intelligent Power Modules (IPM). System implementation of modulated waveforms (MSI). Application of adaptive methods in the control of power electronic systems. Tasks and methods of identification. Cascade control in power electronic systems. Examples of control of selected power electronic systems.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

2. Laboratory exercises: multimedia presentation illustrated with examples given on the board and performance of tasks given by the teacher - practical exercises.

Bibliography

Basic

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

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.

5. Krystkowiak M., Ciepliński Łukasz: Simulation and experimental model of power electronics UPS converter with the possibility of active parallel compensation, COMPUTER APPLICATIONS IN ELECTRICAL ENGINEERING (ZKWE'2018) Book Series: ITM Web of Conferences , Volume: 19, Article Number: UNSP 01025 Published: 2018, DOI: 10.1051/itmconf/20181901025.

6. Krystkowiak M., Ciepliński Ł., Gwóźdź M.: Uninterruptible power supply UPS with active compensation of reactive and distortion power, PRZEGLAD ELEKTROTECHNICZNY Volume: 94 Issue: 5 Pages: 100-103 Published: 2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2
Classes requiring direct contact with the teacher	30	1
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, project preparation)[1]	25	1

[1] delete or add other activities as appropriate