COURSE DESCRIPTION CARD - SYLLABUS

Course name
Control of power electronics systems [S2Eltech1E-MSSwE>SU2]

Course

Field of study
Electrical Engineering

Year/Semester
1/2

Area of study (specialization)
Microprocessor Control Systems in Electrical Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

1,00

Coordinators

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Lecturers

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 the realization of placed problems in the given area of tasks,
- verification skills on every exercise
- 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 a particular way for:
- proposing to discuss additional aspects of the subject
- effective use of knowledge obtained during solving of a given problem;
- comments related to improving teaching material,
- the aesthetics of solved problems and reports within the homework.

Programme content

Control circuits of power devices, methods of measuring current and voltage, measurement algorithms, modulation algorithms, structures and parameters of regulators, simulation models and schematic diagrams of control circuits.

Course topics

Designing schematic diagrams of electronic control and measurement circuits for selected structures of power electronic converters and selecting the parameters of electronic components. Design and implementation of software controlling power electronics systems in selected digital platforms. Implementation of algorithms for measuring electricity parameters, such as average value, RMS value, discrete Fourier transform.

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	30	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50