

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SUPERVISOR DECLARING/CONDUCTING COURSE: dr hab. inż. Leszek Pawlaczyk
DEPARTMENT: K37W05D02
SCIENTIFIC DISCIPLINE: AEE

COURSE CARD

Course name in Polish: Teoria przekształtników statycznych

Course name in English: Theory of static converters

Course language: polish/ ~~english~~

The course is intended for all PhD students: YES / NO

1) ~~BASIC COURSE~~

2) ~~SPECIALIST COURSE~~

3) ~~SEMINAR~~

4) ~~HUMANISTIC COURSE~~

5) ~~LANGUAGE~~

6) ~~RESEARCH SKILLS~~

Subject code: AEQ100156W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has well-established knowledge of: mathematical analysis, in particular differential and integral calculus, ordinary differential equations and trigonometric Fourier series.
2. Has advanced knowledge of the theory of electric circuits.
3. Knows the principles of operation of basic digital and analog electronics.
4. Has knowledge of the description and principles of operation of continuous and discrete automatic control systems.

COURSE OBJECTIVES

C1 Acquainting the listener with the characteristics of modern power semiconductor devices and passive elements used in static converters.

C2 Acquainting the student with the topology and principle of operation of the most commonly used power electronic converters.

C3 Acquainting the student with the basic applications of static power electronic converters.

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PROGRAM CONTENTS

Form of classes		Number of hours
Wa1	Continuous and discrete signals found in converters. Basic methods of analysis.	2
Wa2	Passive elements used in power electronic converters.	2
Wa3	Power semiconductor devices.	2
Wa4	AC / DC and DC / AC converters with phase control.	2
Wa5	AC voltage regulators. Cycloconverters.	2
Wa6	Converters of direct voltage to direct voltage DC / DC with non-isolated output from the input.	2
Wa7	Converters of direct voltage to direct voltage DC / DC with isolated output from the input.	2
Wa8	Autonomous AC / AC voltage inverters.	2
Wa9	Methods of voltage modulation in inverters.	2
Wa10	Multi-level voltage inverters.	2
Wa11	Converter resonant circuits.	2
Wa12	Current inverters.	2
Wa13	Grid converters with improved power factor. Input equalizers. Matrix converters.	2
Wa14	Oddziaływanie przekształtników na sieć zasilająca i odbiorniki energii.	2
Wa15	Rectifiers and active filters.	2
Total hours		30

TEACHING TOOLS USED

N1. Informative lecture with the use of slide presentation
 N2. Own work, independent studies.
 N3. Consultations.

ACHIEVED SUBJECT LEARNING OUTCOMES

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	Examination
Skills	P8U_U	Examination
Social competence	P8U_K	Examination

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PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] H. Tunia, R. Barlik: Teoria przekształtników. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2003
- [2] S. Piróg: Energoelektronika . Układy o komutacji sieciowej i twardej. AGY Uczelniane Wydawnictwa Naukowo Dydaktyczne, Kraków 2006
- [3] R. Barlik, M. Nowak: Energoelektronika. Elementy, podzespoły, układy. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2014.
- [4] T. Citko: Energoelektronika. Układy wysokiej częstotliwości. Wydawnictwo Politechniki Białostockiej, Białystok 2007
- [5] A. Trzynadlowski: Introduction to Modern Power Electronics. John Wiley & Sons, 2016

SECONDARY LITERATURE:

- [1] M. Nowak, R. Barlik: Poradnik inżyniera energoelektronika T1. WNT, Warszawa 2013
- [2] M. Nowak, R. Barlik, J. Rąbkowski: Poradnik inżyniera energoelektronika T2. WNT, Warszawa 2014
- [3] K. Mikołajuk: Podstawy analizy obwodów energoelektronicznych. Wydawnictwo Naukowe PWN, Warszawa 1998.
- [4] S. Januszewski, H. Świątek, K. Zymmer: Przyrządy energoelektroniczne i ich zastosowania. Wydawnictwo Instytutu Elektrotechniki, Warszawa 2008
- [5] L. Gołębiowski, J. Lewicki: Układy elektromagnetyczne w energoelektronice. Oficyna Wydawnicza Politechniki rzeszowskiej, Rzeszów 2012
- [7] Franz Zach; Leistungselektronik: Ein Handbuch Band 1 / Band 2, Springer Verlag 2010

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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