Selected issues of power electronics - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Selected issues of power electronics
Kod przedmiotu	06.2-WE-ELEKTD-SIoPE-Er
Wydział	Wydział Informatyki, Elektrotechniki i Automatyki
Kierunek	Elektrotechnika
Profil	ogólnoakademicki
Rodzaj studiów	Program Erasmus drugiego stopnia
Semestr rozpoczęcia	semestr zimowy 2017/2018

Informacje o przedmiocie

Semestr	2
Liczba punktów ECTS do zdobycia	5
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	• dr hab. inż. Zbigniew Fedyczak, prof. UZ

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	30	2	-	-	Egzamin
Laboratorium	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

Familiarize students with modeling, analysis, properties and characteristics of PWM AC choppers and frequency converters without DC energy storage.

Formation among the students understanding of the need to develop of the multilevel and resonant converter solutions particular in power systems.

Wymagania wstępne

Mathematical analysis, Circuit theory, Power electronics circuits.

Zakres tematyczny

Introduction. General description of the problems in the frame of power electronic circuits and new solutions of semiconductor power electronic devices. Analysis methods of the power electronic circuit properties.

PWM AC choppers. Topologies, operation description and properties of single- and three-phase matrix choppers (MC) and matrix-reactance choppers (MRC). Application examples of such converters.

Matrix converters. Properties of the matrix converters: with low frequency transfer matrix control strategy (Venturini and scalar control methods): with space vector and fictitious DC link control strategy. Application examples of such converters. Matrix-reactance frequency converters. Description of conception of the frequency converters with buck-boost voltage transformation based on matrix-reactance PWM AC choppers. Topologies, operation description and properties of selected solutions.

Multilevel power electronic converters. Concept of multilevel converters. Topologies, operation description and properties of the voltage source inverters. Selected solutions of other multilevel converters and their applications.

Resonance converters. Converters with resonance switch types ZVS, ZCS, quasi- and multiresonance. Converters with resonance load and resonance DC link. Example of selected solutions and their applications.

Galvanic separation in power electronic converters. Galvanic isolation of the signals connected with electrical energy transfer by means of the electromagnetic or piezoelectric couple. Impulse transformer solution. Example of selected solutions and their applications.

Future trends of the power electronic circuits. A new semiconductor power electronic switches and intelligent power modul. Conversion quality improvement as well as new application areas of the power electronic converters.

Metody kształcenia

Lecture, laboratory exercises.

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Has knowledge on circuit and mathematical models of PWM AC choppers and frequency converters without DC energy storage		• bieżąca kontrola na zajęciach • kolokwium	• Wykład • Laboratorium

Warunki zaliczenia

Lecture – obtaining a positive grade in written or oral exam.

Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Calculation of the final grade: lecture 60% + laboratory 40%.

Literatura podstawowa

1. Mohan N., Power Electronics: Converters, Application and Design, John Wiley & Sons, 1998.

2. Trzynadlowski A., Introduction to modern power electronics, John Wiley & Sons, 1998.

3. Erickson R., W., Maksimowić D.: Fundamentals of power electronics. Kluver Academic Publishers, 1999. OPTIONAL READING:

4. Fedyczak Z.: Impulse alternating voltage transforming circuits. University of Zielona Gora Publishing House. Zielona Gora 2003 (in Polish).

5. Szcześniak P. Three-phase AC-AC power converters based on matrix converter topology : matrix-reactance frequency converters concept. Springer, 2013.

Literatura uzupełniająca

1. Pirog S., Power electronics, AGH Publishing House, Cracow, 2006 (in Polish).

2. Holms D., G., Lipo T., A.: Pulse width modulation for power converters. Principles and practice. John Wiley & Sons Inc., 2003.

3. Mikołajuk K., Fundamentals of power electronic circuits analysis, PWN, Warsaw, 1998 (in Polish).

Uwagi

Zmodyfikowane przez dr hab. inż. Zbigniew Fedyczak, prof. UZ (ostatnia modyfikacja: 06-05-2017 12:02)