

## DESCRIPTION OF THE COURSES

- Course code: ELR3263
- Course title: **MODELING AND SIMULATION OF THE CONVERTER-FED DRIVES**
- Language of the lecturer: Polish

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	<i>1</i>		<i>2</i>		
<i>Number of hours/semester*</i>	<i>11</i>		<i>22</i>		
<i>Form of the course completion</i>	<i>credit</i>		<i>credit</i>		
<i>ECTS credits</i>					
<i>Total Student's Workload</i>					

- Level of the course (basic/advanced): advanced
- Prerequisites:
- Name, first name and degree of the lecturer/supervisor:  
Krzysztof P. Dyrz, Ph.D.
- Names, first names and degrees of the team's members:  
Czesław T. Kowalski, D.Sc, Ph.D.
- Year:.....2..... Semester:.....4.....
- Type of the course (obligatory/optional): optional
- Aims of the course (effects of the course): mastery of methods of computer modeling and simulation of converter-fed drives
- Form of the teaching (traditional/e-learning): traditional
- Course description: Lecture deals with typical simulation tasks of static converters and converter-fed drives. It demonstrates: analysis and synthesis methods for power electronics systems, description of topology of power electronics systems and numerical methods for solving of differential equations. Mathematical models of elements of converters, electrical machines, load machines and control systems. Overview of universal software and simulation packages for modeling and simulation of power electronics systems: TCAD, PLEXIM, PSIM and examples for modeling of converter-fed DC and AC drives.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Introduction for modeling and computer simulation	<i>2</i>
2. Analysis and synthesis methods for dynamical systems and power electronics systems, description of topology of power electronics systems	<i>2</i>
3. Mathematical models of elements of converters, electrical machines, loads and control systems.	<i>2</i>
4. Design of control systems for converter-fed DC and AC drives.	<i>2</i>
5. Overview of universal software and simulation packages for modeling and simulation of power electronics systems, examples of applications of TCAD, PLEXIM, PSIM for modeling of converter-fed drives.	<i>2</i>
6. Written text	<i>1</i>

- Classes – the contents:
  - Seminars – the contents:
  - Laboratory – the contents:
    1. Introduction, developing in TCAD software.
    2. Modeling and simulation of 1-phase AC thyristor controller.
    3. Modeling and simulation of uncontrolled rectifiers 4D and 6D.
    4. Modeling and simulation of controlled rectifiers 4T and 6T.
    5. Converter-mode of the 4T and 6T rectifier – analysis and simulation.
    6. Developing of PWM generators.
    7. Modeling and simulation of transistors–bridge.
    8. Modeling and simulation of DC motor.
    9. Modeling and simulation of DC drive supplied from the chopper in the speed control and position control application.
    10. Modeling and simulation of converter–fed AC drives in the speed control application.
  - Project – the contents:
  - Basic literature:
    1. *Orłowska-Kowalska T., Bezczujnikowe układy napędowe z silnikami indukcyjnymi, Oficyna Wydawnicza Politechniki Wrocławskiej 2003*
    2. *Tunia H., Kaźmierkowski M., Automatyka napędu przekształtnikowego, PWN, Warszawa, 1987*
    3. *Szczęsny R., Komputerowa symulacja układów energoelektronicznych, Wydawnictwo Polit. Gdańskiej, 1999*
    4. *User manual of TCAD, PLEXIM, PSIM*
  - Additional literature:
    1. *Osowski S., Modelowanie układów dynamicznych z zastosowaniem języka SIMULINK, Oficyna Wydawnicza Polit. Warsz., 1997*
    2. *Barlik R., Nowak M., Technika tyrystorowa, WNT 1994*
    3. *Tunia H., Winiarski B., Podstawy energoelektroniki, WNT, Warszawa 1994*
  - Conditions of the course acceptance/creditation:
- Lecture – credit, laboratory - credit
- \* - depending on a system of studies