

## DESCRIPTION OF THE COURSES

- Course code: ARR3208
- Course title: **COMPUTER AIDED MODELING AND DESIGN OF THE CONTROLLED SYSTEMS**
- Language of the lecturer: English

<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>15</i>			<i>30</i>	
<i>Form of the course completion</i>	<i>credit</i>			<i>credit</i>	
<i>ECTS credits</i>	<i>1</i>			<i>2</i>	
<i>Total Student's Workload</i>	<i>30</i>			<i>60</i>	

- Level of the course (basic/advanced): advanced
- Prerequisites:
- Name, first name and degree of the lecturer/supervisor: Czesław T. Kowalski dr hab. inż.
- Names, first names and degrees of the team's members: Krzysztof Dyrz dr inż., Krzysztof Szabat, dr inż., Mateusz Dybkowski, mgr inż.
- Year:.....1..... Semester:.....1.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course):
- 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, numerical methods for solving of differential equations. Overview of universal software and simulation packages for modeling and simulation of power electronics systems. Description of the TCAD, PLEXIM, PSIM simulation packages. Mathematical models of elements of converters, electrical machines, load machines and control systems. Examples of applications of TCAD, PLEXIM, PSIM for modeling of converter-fed DC and AC drives.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Modeling and computer simulation - introduction	<i>1</i>
2. Analysis and synthesis methods for dynamical systems.	<i>1</i>
3. Analysis and synthesis methods for power electronics systems.	<i>1</i>
4. Description of topology of power electronics systems. Numerical methods for solving of differential equations.	<i>1</i>
5. Overview of universal software and simulation packages for modeling and simulation of power electronics systems.	<i>1</i>
6. TCAD, PLEXIM, PSIM – description of the simulation packages, models of elements, libraries.	<i>2</i>
7. Mathematical models of elements of converters, electrical machines, load	<i>2</i>

machines and control systems.	
8. Design of control systems for converter-fed DC and AC drives.	2
9. Examples of applications of TCAD, PLEXIM, PSIM for modeling of converter-fed DC drives.	2
10. Examples of applications of TCAD, PLEXIM, PSIM for modeling of converter-fed AC drives.	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
- Project – the contents: realization 4 projects with following problems:

1. Applications of TCAD, PLEXIM, PSIM for modeling and design of un-controlled and controlled rectifiers
2. Applications of TCAD, PLEXIM, PSIM for modeling and design of DC drives supplied from controlled rectifiers.
3. Applications of TCAD, PLEXIM, PSIM for modeling and design of DC drives supplied from the chopper.
4. Modeling and design of AC drive supplied form frequency converter
5. Modeling and design of direct and indirect field oriented controlled induction motor

- Basic literature:

1. *Orłowska-Kowalska T., Bezczyjnikowe 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. *Dokumentacja oprogramowania 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*

- Conditions of the course acceptance/creditation:

Lecture – credit, project - credit

\* - depending on a system of studies