

DESCRIPTION OF THE COURSES

- Course code: **ELR3203**
- Course title: **ELECTRICAL 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>	2		1		
<i>Number of hours/semester*</i>	30		15		
<i>Form of the course completion</i>	E		credit		
<i>ECTS credits</i>	3		1		
<i>Total Student's Workload</i>	90		30		

- Level of the course (basic/~~advanced~~):
- Prerequisites: Electrical machines
- Name, first name and degree of the lecturer/supervisor: **Teresa Orłowska-Kowalska, prof. dr hab. inż., Krzysztof Pieńkowski, dr hab. inż.**
- Names, first names and degrees of the team's members: **Leszek Pawlaczyk, dr inż.; Stanisław Azarewicz, dr inż.; Adam Zalas, dr inż.**
- Year:.....III..... Semester:.....5.....
- Type of the course (obligatory/~~optional~~):
- Aims of the course (effects of the course): *learn of basic problems connected with speed control methods of DC and AC motor drives.*
- Form of the teaching (traditional/~~e-learning~~):
- Course description: Electrical drive system - basic definition, components, regions of operation. Steady state characteristics of different types of motors and loads. Motion equation of electrical drive system with different types of mechanical connections. Equivalent load and inertia torque. DC motor drive systems: speed control in open and closed loops, cascade control. Forming of mechanical characteristics of DC motor drive using different feedback loop. One and two-directional converter-fed DC drive systems. Induction motors - methods of speed control, starting and braking methods for squirrel-cage and wound-rotor machines; principles, basic schematic diagrams, modes of operation, mechanical and control characteristics. Frequency control method of AC motor drive; scalar control methods with voltage and current converters, basics of vector control methods. Speed control methods of wound-rotor induction machines; constant torque and constant power cascade systems. Design methods, state of the art and future trends of electrical drives.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. <i>Electrical drive system - basic definition, components, regions of operation. Steady state characteristics of different types of motors and loads, stable and unstable operating points.</i>	2
2. <i>Motion equation of electrical drive system with different types of</i>	3

<i>mechanical connections. Conditions of stable steady-state operation.</i>	
3. <i>DC motor drive systems: speed control, starting and braking methods.</i>	3
4. <i>Transfer function and block scheme of separate excited DC motor, forming of dynamical properties.</i>	2
5. <i>Forming of DC motor characteristics using different feedbacks.</i>	2
6. <i>Speed and torque control of DC motor in the cascade structure. One and two-directional converter-fed DC drive systems</i>	4
7. <i>Induction motor drives - methods of speed control, starting and braking methods for squirrel-cage and wound-rotor machines; principles, basic schematic diagrams, modes of operation, mechanical and control characteristics.</i>	4
8. <i>Frequency control method of AC motor drive; scalar control methods with voltage and current converters, basics of vector control methods.</i>	4
9. <i>Speed control methods of wound-rotor induction machines; constant torque and constant power cascade systems.</i>	4
10. <i>Design methods, state of the art and future trends of electrical drives.</i>	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
 1. Forming of characteristics of DC motors in different operation modes.
 2. Testing of DC motor drive controlled by bidirectional static converter.
 3. Testing of the electrical starting systems for the squirrel-cage and wounded-rotor induction motors.
 4. Testing of abnormal and unsymmetrical operation modes in the induction motor drive.
 5. Testing of the induction motor drive supplied form the voltage inverter.
 6. Testing of the induction motor cascade drive system of constant power.
 7. Testing of the induction motor cascade drive system of constant torque.
- Project – the contents:
- Basic literature:
 1. *Napęd elektryczny, praca zbiorowa pod red. Z. Grunwalda, WNT, 1987*
 2. *Napęd elektryczny – laboratorium, praca zbiorowa pod red. T. Orłowskiej-Kowalskiej, Oficyna Wyd. P.Wr., 2000*
- Additional literature:
 1. *W.Leonhard, Control of Electrical Drives, Springer Verlag, 1990*
- Conditions of the course acceptance/credition:

Lecture – egzam, Laboratory – presence and performing of all exercises, preparing reports.

* - depending on a system of studies