

DESCRIPTION OF THE COURSES

- Course code: **ELR2202**
- Course title: **CONTROL AND REGULATION IN ELECTRICAL ENERGY SYSTEMS**
- 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				
<i>Number of hours/semester*</i>	30				
<i>Form of the course completion</i>	Colloquium				
<i>ECTS credits</i>	2				
<i>Total Student's Workload</i>	60				

- Level of the course (basic/advanced): **basic**
- Prerequisites:
- Name, first name and degree of the lecturer/supervisor: **Wilhelm Rojewski, Ph.D.**
- Names, first names and degrees of the team's members:
Witold Dzierżanowski, Ph.D.
- Year:....**IV**..... Semester:.....**7**.....
- Type of the course (obligatory/optional): **obligatory**
- Aims of the course (effects of the course): **understanding of principles and functions of control and regulation in power system**
- Form of the teaching (traditional/e-learning): **traditional**
- Course description:

Description of power system as an object of management, control and regulation. Automatic control of turbine, generator and transformer. Voltage and reactive power control in power plants and substations. Complex regulation of active power and frequency (P-f) and reactive power and voltage (Q-U). Dispatcher control. Telecommunication, telemetry and remote control in power system.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Power system as an object of management and control	2
2. Structure and states of operation of power system	2
3. Regulation of turbine in steady states. Static characteristic of controllers.	2
4. Mathematical model of turbine. Turbine control during transients.	2
5. Regulation of generator. Dispatcher diagram.	2
6. AVR of generator. Excitation systems. Mathematical model of regulation sets.	2
7. Operation AVR during transients. Power Systems Stabilizers (PSS)	2

8. Transformer and Under Load Tap Changer (ULTC) mathematical model.	2
9. Algorithm, structure and construction of ULTC	2
10. Compensation of reactive power	2
11. Complex regulation of active power and frequency (P-f) in power system	2
12. Complex regulation of reactive power and voltage (Q-U) in power system	2
13. Power system blackouts	2
14. Dispatcher control. Telecommunication, telemetry and remote control in power system.	2
15. Colloquium	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
- Project – the contents:
- Basic literature:
 1. Machowski J., Bernas S., Stany nieustalone i stabilność systemu elektroenergetycznego, WNT, 1989.
 2. Machowski J., Bialek S., Bumby J.: Power system dynamics and stability. John Wiley and Sons 1998.
 3. Praca zbiorowa pod red. B. Synala, Automatyka elektroenergetyczna, ćwiczenia laboratoryjne. Cz. II, Układy automatyki zabezpieczeniowej i regulacyjnej, Wyd. PWr. 1991.
 4. Instrukcja ruchu i eksploatacji sieci przesyłowej (IRiESP), PSE SA. Internet.
- Additional literature:
 1. Kozuchowski J., Sterowanie systemami elektroenergetycznymi, PWN, 1994
- Conditions of the course acceptance/creditation: **Colloquium**

* - depending on a system of studies