

## DESCRIPTION OF THE COURSES

- Course code: **ELR2205**
- Course title: **CONTROL AND REGULATION IN ELECTRICAL ENERGY SYSTEMS**
- Language of the lecturer: **Pplish**

<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>	<b>1</b>		<b>1</b>		
<i>Number of hours/semester*</i>	<b>15</b>		<b>15</b>		
<i>Form of the course completion</i>	<b>Colloquium</b>		<b>Completion</b>		
<i>ECTS credits</i>	<b>1</b>		<b>1</b>		
<i>Total Student's Workload</i>	<b>30</b>		<b>30</b>		

- 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:.....**I/II stage**..... Semester:.....**1**.....
- 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. Complex regulation of active power and frequency (P-f) and reactive power and voltage (Q-U). Dispatcher control.**

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
<b>1. Power system as an object of management, control and regulation. Structure and states of operation of power system.</b>	<b>2</b>
<b>2. Regulation of turbine. Static characteristic of controllers. Turbine control during transients.</b>	<b>2</b>
<b>3. Regulation of generator. Dispatcher diagram..</b>	<b>2</b>
<b>4. Excitation systems. Mathematical model of regulation sets. Operation of AVR during transients</b>	<b>2</b>
<b>5. Automatic transformer control. Under Load Tap Changer (ULTC).</b>	<b>2</b>
<b>6. Complex regulation of active power and frequency (P-f) and reactive power and voltage (Q-U) in power system</b>	<b>2</b>
<b>7. Dispatcher control. Telecommunication, telemetry and remote control in power system.</b>	<b>2</b>

<b>8. Quiz</b>	<b>1</b>
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- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
  1. **AVR of generator**
  2. **ULTC of transformer**
  3. **Synchronisation of generator**
  4. **Regulation of capacitor bank.**
- 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. **Kożuchowski J., Sterowanie systemami elektroenergetycznymi, PWN, 1994**
- Conditions of the course acceptance/creditation: **Colloquium and completion of laboratory.**

\* - depending on a system of studies