

## DESCRIPTION OF THE COURSES

- Course code: **ELR2571**
- Course title: **MODERN TECHNOLOGIES IN ELECTRIC POWER TRANSMISSION AND DISTRIBUTION**
- Language of the lecturer: **Polish, 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>	<b>1</b>				<b>1</b>
<i>Number of hours/semester*</i>	<b>11</b>				<b>11</b>
<i>Form of the course completion</i>	<b>Test</b>				<b>Presentation</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): **advanced**
- Prerequisites: **credit for a course on power systems**
- Name, first name and degree of the lecturer/supervisor:  
**Wilkosz Kazimierz, PhD, DSc./Professor**
- Names, first names and degrees of the team's members:  
**dr. Robert Łukomski PhD**
- Year: **1** Semester: **3 (the second-level study)**
- Type of the course (obligatory/optional): **obligatory**
- Aims of the course (effects of the course):
  - **understanding tendencies in developing of power systems,**
  - **understanding of significance and principles of operation of power electronic devices utilized in transmission and distribution of electric energy,**
  - **understanding of modern techniques of solving problems of planning, operation and control of power systems,**
  - **enhancing practical skills in preparing presentation,**
  - **developing students' skills in participating in discussion.**
- Form of the teaching (traditional/e-learning): **traditional**
- Course description:  
**Observed changes in development and control of transmission and distribution network. Utilized principles of control of active and reactive power flow in power systems. FACTS devices: development, areas of utilization, advantages and disadvantages. Modern techniques utilized in solving problems of planning, operation and control of power systems.**
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
<b>1. An introduction, the lecture program, requirements. General characteristics of a transmission of alternating current (basic relationships, static and dynamic limits of electric power</b>	<b>2</b>

transmission, classical control of power transmission).	
2. Need of introduction of FACTS devices into transmission and distribution power networks (a general idea of FACTS, development of FACTS in the past, directions of development and solved problems). UPFC devices as devices combining properties of different FACTS devices (principles of operation, schemes, properties, utilization).	2
3. Direct current (DC) solutions in power systems: DC power lines, back-to-back power stations. Trend in development and operation of distribution network. Micronetworks.	2
4. Modern approach to problems of electrical power quality and reliability of power supply (actual conditions, FRIENDS).	2
5. Modern techniques utilized for solving problems related to transmission and distribution power networks (also utilization of artificial intelligence).	2
6. Final test.	1

- Classes – the contents:

- Seminars – the contents:

**At-present-observed changes in development of to transmission and distribution power networks. Trends in dispatcher control of power system on different levels. Different kinds of control of active and reactive power flows in a power system. Different kinds of compensation in power networks. Utilization of power electronic devices in transmission and distribution power networks: development and utilization of FACTS devices, characteristics of FACTS devices paying particular attention to their advantages and disadvantages, also to their harmonic generation. Modern techniques utilized for solving problems related to transmission and distribution power networks**

- Laboratory – the contents:

- Project – the contents:

- Basic literature:

1. Narain G. Hingorani, Laszlo Gyugyi, **Understanding FACTS. Concepts and Technology of Flexible AC Transmission Systems**, Wiley-IEEE Press 1999.
2. E. Acha, C. R. Fuerte-Esquivel, H. Ambriz-Pérez, C. Angeles-Camacho, **FACTS. Modelling and Simulation in Power Networks**, Chichester, John Wiley & Sons, Ltd 2004.
3. Sukumar Kamalasadan, **Application of Artificial Intelligence Techniques in Power Systems**, Special Study Report, Bangkok, Thailand, Asian Institute of Technology 1998.

- Additional literature:

**Papers in conference proceedings and journals.**

- Conditions of the course acceptance/creditation:

**Lectures: positive final test.**

**Seminars: positive evaluation of prepared presentations.**

\* - depending on a system of studies