

DESCRIPTION OF THE COURSES

- Course code: ELR2212
- Course title: POWER SYSTEM AUTOMATION AND SECURITY
- 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>	2				1
<i>Number of hours/semester*</i>	30				15
<i>Form of the course completion</i>	Exam				Report
<i>ECTS credits</i>	4				1
<i>Total Student's Workload</i>	120				30

- Level of the course (basic/advanced): advanced
- Prerequisites:
completed courses: Power System Protection
- Name, first name and degree of the lecturer/supervisor:
Bogdan Miedziński, Prof., Ph. D., D. Sc.
- Names, first names and degrees of the team's members:
Waldemar Rebizant, Ph. D., D. Sc.
- Year: 2 Semester: 3
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course):
As an effect of the course completion the students are expected to present the knowledge on the transient phenomena encountered in power systems and related protection and control concepts as well as to know what methods/systems should be applied to assure safe operation of power systems.
- Form of the teaching (traditional/e-learning): traditional
- Course description:
The course is intended to acquaint students with modern concepts in sensing and contact units components, convertors for digital protections, security problems, trends in substation automation as well as preventive and adaptive protection systems related to power system automation applications. The course describes chosen protection engineering problems of special interest to the student and provides students with a background for further study in science and applications.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. <i>Switching and auxiliary contacts units in automation, classification, parameters and category of utilizations, electrical and mechanical endurance.</i>	3
2. <i>Reed relays and sensors, structure, principle of operation, switching properties and application considerations.</i>	4
3. <i>Advanced current convertors for digital protections, Hall</i>	3

	<i>transformers, Rogowski –coil converters – general consideration, principle of operation, parameters.</i>	
4.	<i>Security problems in MV feeders with no effective earthing under a single phase grounding, ground fault phenomena, problems of earth-fault clearance.</i>	4
5.	<i>Overvoltage protection in power system, external and internal sources of overvoltages, resonance phenomena, arcing ground phenomenon, protection against switching transients.</i>	3
6.	<i>Power line carrier (PLC) system for control, communication and management, general concept, advantages and restrictions.</i>	3
7.	<i>Coordinated control: automatic restoration, auto-reclosing and load shedding in power system.</i>	2
8.	<i>Wide Area Protection Systems – application fields, GPS synchronization of measurements, remote access, information availability, examples of WAPS for protection and maintaining of power system integrity.</i>	2
9.	<i>Substation automation and integration – local and remote control, bay control units, communication protocols, cooperation with SCADA, substation integration levels, co-ordinated protection and control systems.</i>	2
10.	<i>Trends in substation automation – application of Intelligent Electronic Devices, distributed structures, agent-based SA systems, open communication systems, internet-based solutions.</i>	2
11.	<i>Blackouts – reasons of wide area developing faults, USA blackout 2003, preventive systems, adaptive protection systems, wide area control, voltage and angle stability monitoring.</i>	2

- Classes – the contents:

- Seminars – the contents:

Individual tasks and projects on selected problems of modern concepts of the power system automation and security

- Laboratory – the contents:

- Basic literature:

[1] KTV Grattan, Sensors-technology, systems and Applications, A.Hilger IOP Publishing Ltd, 1991.

[2] Power System Protection, volume 4: Digital protection and signalling, Short Run Press Ltd, Exeter, 1997.

[3] H.Ungrad, W.Winkler, A.Wiszniewski: Protection techniques in electrical energy systems, Marcel Dekker Inc. New York, Basel, Hong Kong, 1995.

[4] Selected papers published in renowned international journals.

- Additional literature:

- Conditions of the course acceptance/creditation:

Lecture – exam, Seminar – report

* - depending on a system of studies