

DESCRIPTION OF THE COURSES

- Course code: ELR1110
- Course title: ADVANCED HIGH VOLTAGE TECHNOLOGY
- 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		1
<i>Number of hours/semester*</i>	30		15		15
<i>Form of the course completion</i>	Exam		Reports		Presentation
<i>ECTS credits</i>	3		2		1
Total Student's Workload	90		60		30

- Level of the course (basic/advanced): advanced
- Prerequisites: Passed course: Mathematics, Physics, Electrotechnics fundamentals.
- Name, first name and degree of the lecturer/supervisor: Bolesław Mazurek, prof., DSc, PhD.
- Names, first names and degrees of the team's members:
 1. Krystian Chrzan, Ph.D.
 2. Adam Tymań, Ph.D.
 3. Jacek Wańkiewicz, DSc, PhD.
- Year:....II..... Semester:.....3.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): Acquaintance with modern methods of generation and measurement of high voltage. Knowledge about application of high electric fields in industry technological processes, in agriculture, medicine and science.
- Form of the teaching (traditional/e-learning): traditional
- Course description:

The course discusses the newest technology issues and knowledge necessary for electrical engineers. Generation of high voltage and high voltage measurement techniques will be discussed. Electrical field distribution and electrical field control methods will also be presented. A significant part of the lecture is the presentation of electrical discharges in gases, fluids, vacuum and solid dielectrics. The transmission DC lines and high electrical field application for technology processes will be shown as examples of practical high voltage engineering. Few laboratory trainings supplement the course giving the possibility to measure the voltages up to few hundred kV.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Historical perspective, development of high voltage power networks, EC Directives, the future of HV engineering	2
2. Generation of high voltages and high currents	2
3. High voltage measurements	2

4. Electrical fields distribution and stress control, numerical methods	2
5. Gaseous electrical insulation	2
6. Vacuum electrical insulation	2
7. Liquid electrical insulation	2
8. Solid electrical insulation	2
9. Over-voltage protection	2
10. HVDC transmission	2
11. Circuits breakers and interruption	2
12. Non-destructive test techniques	2
13. Optical measurements and monitoring in high voltage environment	2
14. Pulsed power – principles and application	2
15. High voltage techniques in technological processes	2

- Classes – the contents:
- Seminars – the contents:
 1. Ceramic and non ceramic insulators for high voltages
 2. Polymer insulated power cables
 3. SF₆ insulation, GIS
 4. Power generators, transformers
 5. Voltage dividers, current transformers
 6. Metal oxide surge arresters
 7. Current limiters
- Laboratory – the contents:
 1. Introduction, safety rules, laboratory set up manual
 2. Generation of impulse voltages
 3. Methods of ac and dc voltage measurement
 4. Breakdown voltage in pure air, flame, vacuum and solid dielectrics
 5. Induced voltage measurement
 6. PC aided leakage current measurement
 7. Diagnostics of metal oxide arresters
- Project – the contents:
- Basic literature:
 - [1] Haddad A., Warne D., Advances in High Voltage Engineering. Institution of Electrical Engineers 2004
 - [2] Kuffel E., Zaengl W.S., Kuffel J., High Voltage Fundamentals. Newnes 2003
 - [3] Beyer M., Boeck W., Moeller K., Zaengl W., High voltage engineering. Springer 1986
- Additional literature:
- Conditions of the course acceptance/creditation: Passed exam, all reports done and presentation for the seminar prepared.

* - depending on a system of studies