STUDY MODULE DESCRIPTION FORM

Name of the module/subject **High voltage engineering**			Code **1010324361010311585**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **general academic**		Year /Semester **3 / 6**
Elective path/specialty **-**	Subject offered in: **Polish**		Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**		
No. of hours Lecture: **20** Classes: **-** Laboratory: **20** Project/seminars: **-**			No. of credits **3**
Status of the course in the study program (Basic, major, other) **other**	(university-wide, from another field) **university-wide**		
Education areas and fields of science and art **technical sciences** **Technical sciences**			ECTS distribution (number and %) **3 100%** **3 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	He/she has knowledge in frame of electric engineering material science, and knows fundamental principles of theory of electrical circuits.
2	**Skills**	He/she can build simple electrical system.
3	**Social competencies**	He/she can work and cooperate in group.

Assumptions and objectives of the course:

To know simple tasks connected to high voltage engineering. To know sources of test Voltage. To know methods of measurements of typical properties for high voltage engineering. To know fundamental definitions regarding to Overvoltage protection.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. He/she has knowledge in frame of systems to generate high voltage (DC, AC, pulse). - [K_W13+, K_W26+++]
2. He/she has knowledge in frame of overvoltage protection of buildings and electric power lines. - [K_W13++, K_W19++, K_W26++]

Skills:

1. He/she can make measurements of physical properties describing insulation systems. - [K_U02++, K_U14++]
2. He/she can make measurements of high voltage using various method. - [K_U02+, K_U03+]

Social competencies:

1. He/she knows effects of influence of high voltage insulating systems on natural environment. - [K_K02++]
2. He/she knows effects and needs of protection against atmospheric lights. - [K_K02+]

Assessment methods of study outcomes

http://www.put.poznan.pl/

Lectures

? Assessment of knowledge and skills proved on tests,

Laboratories:

? Tests and preemie of knowledge which is necessary to realize fundamental tasks in some fields of laboratory,

? Continuous assessment on each laboratory ? preemie of knowledge increase,

? Assessment of knowledge and skills connected to realization of laboratory tasks, assessment of report.

Course description

Sources of DC test voltage, AC (high voltage transformer) and pulse (Marx generator). Method of measurements of electrical properties, describing high voltage engineering, such as electrical strength (plate spark gap, spherical spark gap, cylindrical spark gap, sharp spark gar), resistance (Schering bridge), surfacial resistance, capacity (Schering bridge), partial discharge, dielectric losses factor (Schering bridge). Overvoltage protection (overvoltage factor, source of overvoltage, spares, attenuation of overvoltage waveform, overvoltage installations, touch voltage).

In frame of laboratory, following subjects are realized: measurements of electrical strength of plate spark gap, spherical spark gap, cylindrical spark gap, sharp spark gap; relationship between electrical strength of air and pressure; influence of space charge on electrical strength of air; surfacial breakdown; distribution on voltage on insulator; methods of measurements of high voltage; development of conductive bridge in oil; analysis of transformer oil.

Basic bibliography:

1. Flisowski Z., High Voltage Engineering, WNT, Warszawa, 1988.

2. Kosztaluk R. i inni, Technika badań wysokonapięciowych, tom I i II, WNT, Warszawa, 1985.

3. Florkowska B., Electrical strength of gas high voltage insulation systems, Uczelniane Wydawnictwo Naukowo ? Dydaktyczne AGH, Kraków, 2003.

4. Florkowska B., High Voltage Techniques, Wydawnictwo AGH, Kraków, 1988.

5. Gacek Z., High Voltage Techniques, Wydawnictwo Politechniki Śląskiej, Gliwice, 1999.

6. Laboratories in frame of material science and techniques of high voltage, pod redakcją H. Mościckiej ? Grzesiak, skrypt, Wydawnictwo Politechniki Poznańskiej, Poznań, 2002.

Additional bibliography:

1. Florkowska B. i inni, Mechanizms, measurements and Analysis of partia discharges in Diagnostic of high voltage insulation systems, Uczelniane Wydawnictwo Naukowo ? Dydaktyczne AGH, Kraków, 2001.

2. Gacek Z., Construction of high voltage insulating systems used in electric power, Wydawnictwo Politechniki Śląskiej, Gliwice, 2002.

3. Gacek Z., High Voltage Techniques, Wydawnictwo Politechniki Śląskiej, Gliwice, 2006.

4. Szpor S., Electrical strength and insulation techniques, PWN, Warszawa, 1959.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	20
2. Participation in laboratories	20
3. Participation in exam	3
4. Preparation to exam	10
5. Consultation	2
6. Preparation to laboratories	20
7. Preparation of laboratory reports	10

Student's workload

Source of workload	hours	ECTS
Total workload	85	3
Contact hours	50	2
Practical activities	55	1

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