STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Electrical devices		**1010321351010310067**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**3 / 5**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours	No. of credits
Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **-**	**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**
Technical sciences	**3 100%**

Responsible for subject / lecturer:

prof. dr hab. Aniela Kamińska-Benmechernene, prof. nadzw.
email: aniela.kaminska@put.poznan.pl
tel. 61 665 26 67
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of phenomena occurring in electrical devices and systems as well as their mathematical and physical description. Purchase Basic knowledge on electrical engineering, mathematics, physics and electrical metrology.
2	**Skills**	Able to perform mathematical analysis of simple electrical circuits and read electrical wiring schemes.
3	**Social competencies**	A sense of the need to broaden the competence and willingness to work together in a team.

Assumptions and objectives of the course:

Knowledge of phenomena occurring in electrical devices and systems as well as their mathematical and physical description. Purchase of skills in the application of phenomena description to design of power supply and hazard assessment that can occurs in these systems. Experiment planning, selection of measurement instrument, realization of test set-up, researches performing and results analyzing.

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

Knowledge:

1. Know how describe phenomena occurring in electrical devices and power supply. - [K_W03 ++, K_W04+++, K_W08 +++]
2. Know how formulate mathematical and physical description of phenomena: conductors and devices heating, electrodynamics effects, recovery voltages, switching arc and its extinction. - [K_W01 ++, K_W03 ++, K_W04 +++]

Skills:

1. Able to analyze the mathematical and physical descriptions of phenomena for the different operating states and conditions. - [K_U10 ++, K_U11 +++]
2. Able to perform the calculation and estimation of hazard assessment occurring in electrical devices and power supply systems. - [K_U10 ++, K_U11 +++]
3. Able to plan experiment, measurement instrument select, test set-up realize, perform researches and analyze of results. - [K_U02+++, K_U14+++]

Social competencies:

1. A sense of influence of proper devices selection and analysis of phenomena on ensuring supply continuity to different electricity consumers. - [K_K01 +, K_K02 +++]

2. A sense of influence of phenomena and devices on the environment and the people working with electrical equipment and using them, and the consequent need for extensive cooperation both at the design stage and utilization. - [K_K02 +++, K_K03 +++]

Assessment methods of study outcomes

Lecture:

? skills assessment to analyze the description of phenomena for selected systems, conditions and assumptions,

? assessment of knowledge and understanding of key terms.

Laboratory exercises:

? skills assessment of experiment planning,

? skills assessment of the experimental set-up and devices selection,

? assessment of the experiment carry out and the analyzing of results using modern methods and software,

? assessment of the measurement accuracy analysis and conclusions.

Getting extra points for the activity during seminar, and in particular for:

? proposing and analysis mathematical and physical phenomena in systems and conditions that were not discussed at the lecture,

? proposing other models of phenomena and their analysis,

? teamwork implementation of the extended experiment in a laboratory,

? the use of modern methods to describe measurement results and proposing the extended conclusions.

Course description

Heating of conductors by operating currents: determination of heating and cooling functions, steady state heating, heating by short circuit currents. Electrodynamics interactions: forces in parallel and perpendicular conductors, forces produced by alternating current and in busbar systems. Switching arc and its extinction: model of arc, DC and AC arc characteristics and extinction condition. Transient recovery voltage (TRV) in electric power systems: periodic and non-periodic TRV in one-frequency circuit and its parameters, TRV during switching in long line ? method of traveling waves.

Basic bibliography:

1. J. Maksymiuk ? Aparaty elektryczne, WNT, Warszawa, 1992

2. H. Markiewicz, Instalacje elektryczne, WNT, Warszawa 2000

3. C. Królikowski, Z. Boruta, A. Kamińska, Technika łączenia obwodów elektroenergetycznych. Przykłady obliczeń, PWN Warszawa 1992

Additional bibliography:

1. C. H. Flurscheim ? Power circuit breaker theory and design. Peter Peregrinus Ltd, 1980

2. A. Greenwood ? Electrical transients in power systems, John Wiley and Sons, New York, 1991

Result of average student's workload

Activity	Time (working hours)
1. participation in the class lecture	15
2. participation in the laboratory exercises	15
3. participation in the consulting on the lecture and laboratory exercises	8
4. preparation to the laboratory exercises	8
5. preparation of practical exercises report	12
6. preparation to the written exam	20

Student's workload

Source of workload	hours	ECTS
Total workload	78	3
Contact hours	38	2
Practical activities	25	1