STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Power networks and power system control		**1010311361010315992**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**3 / 6**

Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Networks and Electric Power Systems	**Polish**	**obligatory**

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

No. of hours					No. of credits
Lecture: **30**	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:

dr inż. Ireneusz Grządzielski
email: email: ireneusz.grzadzielski@put.poznan.pl
tel. 61 665 2635 (2392)
Faculty of Electrical Engineering
ul. Piotrowo 3A, 60-965 Poznań

Responsible for subject / lecturer:

dr inż. Bogdan Staszak
email: email:bogdan.staszak@put.poznan.pl
tel. 61 665 2635
Faculty of Electrical Engineering
ul. Piotrowo 3A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Possesses basic knowledge of the theory of electrical circuits, electrical machines, electric power engineering and electrical power generation
2	**Skills**	Has effective self-study ability in the domain of the chosen specialization, is able to integrate the knowledge acquired at the credited courses
3	**Social competencies**	Is aware of the need to develop his knowledge and competencies, is ready to undertake the cooperation and team work

Assumptions and objectives of the course:

Getting knowledge of the electric power system operation under steady operating conditions, methods of simulation computations of the power flows in the HV and EHV meshed networks, market-based power flow optimization, computations of the symmetrical and asymmetrical steady short-circuit conditions in the power system, practical use of the power flow computation program (PLANS) and short-circuit computation program (SCC) applied by the PSE Operator.

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

Knowledge:

1. Has general knowledge of automatics and automatic control fundamentals - know the criteria and principles of selection power protection automation devices - [K_W22++]

2. Has knowledge of the electric power system fundamentals including structure and operation states of the electric power sectors: generation, transmission and distribution, knows basic rules of the operation and maintenance of the electric power system elements - [K_W24 +++]

3. Has knowledge of the electric power engineering development trends in the EU integrated electric power system as well as rules of its safe operation - [K_W25++]

Skills:

1. Can elaborate the engineer task completion?s documentation and describe the task?s results - [K_U07++]

2. Can choose suitable technique and use measuring equipment (analog or digital) to measure the basic measurable magnitudes typical for engineering - [K_U14+]

3. Can properly use and maintain electrical devices according to the general requirements and technical docu - [K_U23+++]

Social competencies:

1. Is aware of the weight and understands different aspects and effects of the electric engineer?s activities including those related to the environmental impact and regarding the responsibility for the undertaken decisions - [K_K02++]

Assessment methods of study outcomes

Lectures:

1.Assesment of the knowledge and skills shown at the written and oral examinations ,

2.Continuous assessment during courses (bonus for activity and perception quality).

Laboratory:

1. Test of the knowledge necessary to deal with problems posed in the lab tasks.
2. Assessment of the knowledge and skills related to the lab task completion,
3. Assessment of the task report

Course description

Lectures: Transient states in the electric power system. Steady states in electric power system. Market-based optimization of the power system operation. Power flow calculations ? role of the node potential method. Application of the Gauss and Newton ?Raphson iteration technique to solve the non-linear node equations. Power flow optimization. Estimation of the power system conditions. Calculations of the steady short-circuit conditions in the electric power system ? non-symmetrical short-circuit analysis using symmetrical component method, models of the system elements for symmetrical components.

Laboratory: involves experiments carried out using the power flow programs (PLANS) and short-circuit calculation programs (SCC) concerning topics presented in lectures.

Basic bibliography:

1. Kremens Z. , Sobierajski M. : Analiza systemów elektroenergetycznych. WNT, Warszawa, 1996.
2. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych. WNT, Warszawa, 2002
3. Poradnik Inżyniera Elektryka . t.3. WNT, Warszawa 2005

Additional bibliography:

1. Cegielski M.: Sieci i systemy elektroenergetyczne. PWN, Warszawa, 1979.
2. Kończykowski S., Bursztyński J.: Zwarcia w układach elektroenergetycznych. WNT, Warszawa, 1965.

Result of average student's workload

Activity	Time (working hours)
1. participation in lecture courses	30
2. participation in labs	15
3. participation in discussions related to lectures	10
4. participation in discussions related to labs	10
5. preparation to labs	7
6. lab reports? elaboration	10
7. preparation to examination	10
8. taking an examination	3

Student's workload

Source of workload	hours	ECTS
Total workload	95	3
Contact hours	70	2
Practical activities	25	1