

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject The work of electric power system		Code 1010315241010313673
Field of study Electrical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 4
Elective path/specialty Networks and Electric Power Systems	Subject offered in: polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 9 Classes: - Laboratory: 9 Project/seminars: -		No. of credits 2
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 2 100%
Responsible for subject / lecturer: Dr inż. Ireneusz Grządzielski email: ireneusz.grzadzieski@put.poznan.pl tel. 61 665 2635 (2392) Wydział Elektryczny 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, electromagnetic field, electrical machines, High voltage techniques, electric power engineering and electrical power generation
2	Skills	Has effective self-study ability in the domain of the chosen field of studies, 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 transient operating conditions, electric power system stability investigations under both the small disturbances and the instantaneous high disturbances in the active power balance. Stability enhancement means. Practical service of the program DAKAR in the scope of transient states analysis for low and large disturbance as well as during system failures.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has knowledge of development trends and the most important new achievements in electrical engineering - [K_W04+] 2. Has widened knowledge of the electric power system construction and operation - [K_W16+++] 3. Has knowledge related to the construction of optimizing and decision algorithms enabling the stable operation of the electric power system - [K_W17++]		
Skills:		
1. Can run analysis of the complex electric systems using suitable tools, modifying the existing analysis methods, if necessary - [K_U07++] 2. Can design the electrical elements, devices and systems regarding set criterions, both operational and economic ones - [K_U12++]		
Social competencies:		
1. Understands the need to formulate and transfer to the society, using also the mass media, the information and opinions related to the electrical engineering achievements - [K_K02++]		
Assessment methods of study outcomes		

<p>Lectures:</p> <ol style="list-style-type: none"> 1. Assessment of the knowledge and skills shown at the written and oral examinations , 2. Continuous assessment during courses (bonus for activity and perception quality). <p>Laboratory:</p> <ol style="list-style-type: none"> 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		
<p>Lectures : Transient states in electric power system: types of states, system disturbances. Scope of the transient states' study and analysis. Models of the System elements for the transient analysis needs. Electric power system stability. Small swing of the generators' rotor - local angle stability. Power-angle characteristics- application of the Lapunov rule. Influence of the voltage regulation on local stability. Stability under the large instantaneous disturbance of the active power balance - global angle stability. Application of the indirect Lapunov rule. Voltage stability - voltage stability conditions. Stability enhancement means.</p> <p>Laboratory: involves experiments carried out using the DAKAR program, in the scope of steady states and of the transient states of in the transmission and distribution networks of the electric power system described during lectures.</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. Machowski J. : Stany nieustalone i stabilność systemu elektroenergetycznego. WNT, Warszawa, 1989. 2. Machowski J.: Regulacja i stabilność systemu elektroenergetycznego. OWPW, Warszawa 2007. 3. Machowski J., Białek J., Bumby J. Power System Dynamics: Stability and Control. IEEE Wiley, 2008. 4. Poradnik Inżyniera Elektryka . t.3. WNT, Warszawa 2005 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. Z. Kremens, M. Sobierajski: Analiza systemów elektroenergetycznych. WNT, Warszawa, 1996. 2. Zb. Jasicki : Elektromechaniczne stany przejściowe w systemach energetycznych. T.1 i 2. PWN, Warszawa, 1987 		
Result of average student's workload		
Activity	Time (working hours)	
1. participation in lecture courses	9	
2. participation in labs	9	
3. participation in discussions related to lectures	6	
4. participation in discussions related to labs	6	
5. preparation to labs	10	
6. lab reports	10	
7. preparation to examination	15	
8. taking an examination	3	
Student's workload		
Source of workload	hours	ECTS
Total workload	68	2
Contact hours	33	1
Practical activities	35	1