STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Electric Power Systems - Operation and Control		**1010312331010314897**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**2 / 3**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Electric Power Systems	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-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:

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Responsible for subject / lecturer:

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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 widened and deepened knowledge of some fields of mathematics including discrete and applied math elements - [K_W01++]
2. Has widened knowledge of the electric power system construction and operation - [K_W16+++]

Skills:

1. Can use acquired mathematical techniques and models, modifying it if necessary, to analyze and to design electrical elements, devices and systems - [K_U06++]
2. Can plan and carry out the simulation and measurements of basic electric parameters as well as to extract parameters describing materials, electrical elements and systems - [K_U09++]

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

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 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 I 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.

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.

Basic bibliography:

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:

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	15
2. participation in labs	15
3. participation in discussions related to lectures	5
4. participation in discussions related to labs	5
5. preparation to labs	6
6. lab reports	6
7. preparation to examination	10
8. taking an examination	3

Student's workload

Source of workload	hours	ECTS
Total workload	65	3
Contact hours	40	1
Practical activities	34	1