COURSE DESCRIPTION CARD - SYLLABUS

Course name
Operation and control of power systems

Course

Field of study
Electrotechnics

Year/Semester
2/3

Area of study (specialization)
Electrical Power Systems

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
mgr inż. Krzysztof Łowczowski

email: krzysztof.lowczowski@put.poznan.pl

tel. 616652270

Wydział Inżynierii Środowiska i Energetyki

ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:
dr inż. Krzysztof Szubert

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tel. 616652282

Wydział Inżynierii Środowiska i Energetyki

ul. Piotrowo 3A, 60-965 Poznań

Prerequisites

Has basic knowladge of power circuit theory, elecrical devices, electrical power engineering and generation of electricity. Has the ability to effectively self-study in a field related to the chosen specialization, combining knowledge acquired in the previously completed subjects. Is aware of the need to expand his knowledge and competence, readiness to cooperate and cooperate in a group.

Course objective

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

programs in the scope of transient states analysis for low and large disturbance as well as during system failures.

Course-related learning outcomes

Knowledge

Has extensive knowladge about some mathematic sections, which is essential for modeling and analysis of complex devices and electrical circuitsm, as well as description and analysis developed electirical circuits.

Has extensive knowladge about construction and principles of power system operation, related with generation, distribution and conversion of electricity.

Skills

Is able to use different methods and mathematical models, ably to adjust models to presant needs, for analysis and design of processes, devices and power systems.

Is able to plan and run a simulation and take measurement of basic electrical and non-electrical parameters. Is able to characterize materials, elements and electrical circuits.

Social competences

Is aware of need of continous development of job related skills. Is aware of professional, ethical rules.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

Programme content

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 thevoltage 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.

Teaching methods

Lecture: the theory of the closely related to practice, Multimedia lecture

Laboratory: Computational experiments, working in a team

Bibliography

Basic

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

Literatura uzupełniająca:

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	2,0

[1] delete or add other activities as appropriate