STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Safety control engineering in electrical grid and in power plants	**1010311461010316135**

Field of study	Profile of study (general academic, practical)	Year /Semester
Power Engineering	**(brak)**	**3 / 6**
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: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**	**4**

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 %)

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**	Basic knowledge within the scope of electrical engineering, electrical power engineering and electrical power systems and networks.
2	**Skills**	Ability to effective self-studying in the domain connected with chosen course of studying, ability to use computer simulation to evaluate performance of elements of power system.
3	**Social competencies**	Has a consciousness of necessity to widen competences and willingness to work in a team.

Assumptions and objectives of the course:

The objective is to acquaint with basic tasks and technical solutions of electric power system protection (EAZ) in electric power systems.

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

Knowledge:

1. Has the basic knowledge within the scope of renewable energy sources, like wind power, solar power, biomas and geothermal power. Know and understand phenomena, processes and devices allowing on conversion of energy renewable sources into electric energy and heat - [K_W09+++]
2. Is familiar with current state and modern trends of power engineering development - [K_W20++]

Skills:

1. Is able to collect information from literature, data bases, and other sources, is able to integrate and interpret gained information and also to conclude and to formulate and validate opinions - [K_U01++]
2. Is able to work solely and in the team , can estimate time necessary to complete ordered task, is able to elaborate and realize schedule of works allowing to keep to the deadlines - [K_U02++]
3. Is able to use properly chosen methods and devices allowing to weasure basic quantities characterizing electric power elements and systems - [K_U10++]

Social competencies:

1. Has a consciousness of validity and understand non-technical aspects and effects of activity of electric power engineer such as influence on environment and responsibility connected with this activity - [K_K02++]
2. Has a consciousness about responsibility for his own work and ability to accept the rules of work in the team and to be responsible for collective realized tasks - [K_K04++]

Assessment methods of study outcomes

Lecture

- evaluation of the knowledge and competitions on written exam (problem character)
- permanent evaluation on every class rewarding for activity and quality of perception

Laboratory

- pre-classes verifying tests
- rewarding the knowledge necessary for realization of problems connected with laboratory tasks
- evaluation of the exercise report
- permanent evaluation on every class rewarding increase of competence to use learned investigation methods

Course description

Lectures:

Tasks and functions of elements of electric power system protection (EAZ), digital technology, protection systems for generators, transformers and lines. Power system automation: SPZ, SCO, SZR. Modern solutions of EAZ systems used in power system and basics of selection of settings.

Update 2017:

Applied methods of education:

- lecture with multimedia presentation (drawings, photos, videos) supplemented by records on the board,
- interactive lecture with questions to students,
- theory presented in close connection with practice.

Laboratory:

Laboratory classes related to investigation of basic protections (relays) using basic measurement devices and of it's autonomic sets and of models of the elements of electric power systems.

Update 2017:

Applied methods of education:

- group work,
- demonstrations,
- detailed review of the reports (by teacher) and discussion of the comments.

Basic bibliography:

1. Hoppel W.: Sieci średnich napięć. Automatyka zabezpieczeniowa i ochrona od porażeń. PWN, Warszawa 2017
2. Winkler W., Wiszniewski A.: Automatyka zabezpieczeniowa w systemach elektroenergetycznych, Wyd. II. WNT, Warszawa 2004
3. Szafran J., Wiszniewski A.: Algorytmy pomiarowe i decyzyjne cyfrowej automatyki elektroenergetycznej. WNT, Warszawa 2001
4. Borkiewicz K.: EAZ w sieciach elektroenergetycznych ŚN i WN. ZiAD, Bielsko Biała 2016

Additional bibliography:

1. Musierowicz K., Staszak B.: Technologie informatyczne w elektroenergetyce. Wyd. PP, Poznań 2010
2. Lorenc J.: Admitancyjne zabezpieczenie ziemnozwarciowe. Wyd. PP, Poznań 2007
3. Hoppel W., Olejnik B.: Elektroenergetyczna automatyka zabezpieczeniowa dla sieci średniego napięcia z elektrowniami lokalnymi. INPE ? miesięcznik Stowarzyszenia Elektryków Polskich, nr 177/2014
4. Christopoulos C., Wright A.: Electrical Power System Protection. Springer US, 1999

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	15
2. Tutorials related to lectures	2
3. Preparation to exam	8
4. Participation in exam	2
5. Participation in laboratory classes	15
6. Preparation of reports	5

Student's workload

Source of workload	hours	ECTS
Total workload	47	3
Contact hours	34	2
Practical activities	20	1