STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Electric power protection automatics**	Code **1010312331010311551**

Field of study **Electrical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**

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) **full-time**

No. of hours				No. of credits **3**
Lecture: **15**	Classes: **-**	Laboratory: **15**	Project/seminars: **-**	

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 %**)** **3 100%**

Responsible for subject / lecturer:

prof. dr hab. inż. Józef Lorenc
email: jozef.lorenc@put.poznan.pl
tel. 61 6652279
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has knowledge within the scope of fundamentals of electrical engineering, electrical power engineering, electrical metrology and informatics
2	**Skills**	Is able to carry out calculations of power network alone and to carry out basic measurements of electrical circuits using modern control-measuring apparatus
3	**Social competencies**	Has a consciousness of necessity to complete specialist knowledge and to carry out cooperation in group

Assumptions and objectives of the course:

To acquire specialist knowledge in the range of the work of electric power protection. To acquaint with basic decision-measurement algorithms of modern devices EAZ. To acquaint with general principles of EAZ devices designing.

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

Knowledge:

1. 1.   Has the basic knowledge about measuring systems in high voltage power substations and about making use of digital techniques in measurement signals processing and about modern devices [EAZ]] constructing - [K_W05+, K_W11++]

2. 2.   Has knowledge about selecting devices and settings of protection and about computer methods of short circuits calculations and signal processing for the needs of protection - [-K_W11+, K_W22+++]

Skills:

1. Is able to analyze the conditions of work of electric power devices and to evaluate the risk of disruptions updating and broadening the knowledge in this range ?   - [K_U09+]

2. Is able to make use of specialized programs for computer aided calculations and making decision in the range of the work of network and electric power protection. - [K_U13 ++,K_U22 ++]

Social competencies:

1. Has a consciousness of social effects of proper use of electric power and negative results of it?s shortage due to network and electric power system failure - [K_K02++]

Assessment methods of study outcomes

The evaluation of knowledge and competition proved in short written problem test, current evaluation during classes (rewarding activity and quality of perception)

Course description

Program substances of the module concern the knowledge in the range of automatics of electric power protection (EAZ). The role of eliminative, preventive and restitution automatics. Basic protection elements and protection systems of generators, lines, transformers and asynchronous engines. Measuring systems in electric power substations. Selectivity and sensitivity operation conditions and logic function while making a decision.

Basic bibliography:

1. Żydanowicz J. Elektroenergetyczna automatyka zabezpieczeniowa. WNT -Warszawa, tom I (1979), tom II (1985), tom III (1989)

2. Winkler W., Wiszniewski A. Automatyka zabezpieczeniowa w systemach elektroenergetycznych. WNT ? Warszawa 1999

3. Lorenc J.: Admitancyjne zabezpieczenia ziemnozwarciowe. Wydawnictwo Politechniki Poznańskiej 2007 .

4. Zilouchian A., Jamshidi M.: Intelligent Control Systems Using Soft Computing Metho-dologies. CRC Press, 2001

5. Musierowicz K., Staszak B.: Technologie informatyczne w elektroenergetyce. Wydawnictwo Politechniki Poznańskiej 2010 .

6. Elaboration of report from laboratory exercises

Additional bibliography:

1. P. Kacejko, J. Machowski : Zwarcia w sieciach elektroenergetycznych, WNT, Warszawa, 2002r

2. P. Kundur : Power System Stability and Control , McGraw-Hill. Inc., 1993 .

3. Rosłowski E.: Cyfrowe przetwarzanie sygnałów w automatyce elektroenergetycznej. Akademicka Oficyna Wydawnicza EXIT, 2002

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	15
2. Preparation for written test	10
3. Consultations in range of lecture	3
4. Participation in laboratory exercises	15
5. Preparation for laboratory exercises	10
6. Consultations in range of laboratory exercise	3
7. Elaboration of report from laboratory exercises	15

Student's workload

Source of workload	hours	ECTS
Total workload	71	3
Contact hours	36	2
Practical activities	53	1