



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electric power protection automatics

### Course

Field of study

Electrical Engineering

Area of study (specialization)

Networks and power system protection

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### 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:

dr inż. Bogdan Staszak

Responsible for the course/lecturer:

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Wydział Elektryczny

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### Prerequisites

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

### Course objective

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.



### Course-related learning outcomes

#### Knowledge

1. Has extended theoretical knowledge in the field of modern measuring systems and signal processing for the needs of EAZ devices.
2. Has broadened knowledge in the selection of devices and electrical power control settings and the analysis of their working conditions.

#### Skills

1. Is able to evaluate the working conditions of power protection equipment and choose the right solutions for EAZ circuits.
2. Is able to use simulation programs supporting the analysis of the system operation and EAZ circuits.

#### Social competences

Is aware of the social effects of proper use of electricity and energy needs of the country.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

#### Lecture:

- assessment of knowledge and skills demonstrated during the written test problem-related (students can use any teaching materials),
- ongoing assessment of each class (rewarding activity and quality of perception).

#### Laboratory exercises:

- test and rewarding of knowledge necessary to implement the problems posed in a given area of laboratory tasks,
- continuous assessment, during each class - rewarding the increase in the ability to use known principles and methods,
- assessment of knowledge and skills related to the implementation of the exercise task, evaluation of the report of the exercise,
- taking into account the laboratory task in team performance assessment.

### Programme content

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.

### Teaching methods



Lecture: Multimedia presentation illustrated with examples on the board.

Laboratory:

- work in teams,
- demonstrations,
- detailed review of reports by the laboratory leader and discussions on comments.

### Bibliography

Basic

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 Methodologies. CRC Press, 2001
5. Musierowicz K., Staszak B.: Technologie informatyczne w elektroenergetyce. Wydawnictwo Politechniki Poznańskiej 2010 .
6. Elaboration of report from laboratory exercises.

Additional

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

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	35	1,0

<sup>1</sup> delete or add other activities as appropriate