COURSE DESCRIPTION CARD - SYLLABUS

Course name
Measurement and executive systems of power automation [N1Eltech1>PO-PA-UP]

Course

Field of study
Electrical Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
20

Laboratory classes
20

Other (e.g. online)
0

Tutorials
0

Projects/seminars
10

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

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

Course objective

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

Course-related learning outcomes

Knowledge:
1. Has basic knowledge of the basics of automation and automatic control, knows the operating criteria and rules for the selection of electrical power protection equipment.

2. Has theoretically founded knowledge of the power system, including the structure and operating states of the manufacturing, transmission and distribution sectors; knows and understands the basic principles of operation of elements of the power system.

Skills:
1. Is able to design and manufacture, in accordance with the given specification and using appropriate methods, techniques, tools and materials, typical electrical systems for various applications.
2. Is able to use his knowledge in the selection of measuring equipment in order to perform the measurement and acquisition of basic measurable quantities characteristic of electrical engineering, in typical and atypical conditions (not fully predictable).
3. Is able to choose the sources and information derived from them (catalog cards, application notes) in order to assess, analyze and synthesize the relevant elements of the designed electrical system or system.

Social competences:
1. Is aware of the importance of own work and the need to comply with the principles of professional ethics, is ready to comply with the principles of team work and take responsibility for jointly implemented tasks, as well as care for the achievements and traditions of the profession.
2. Is able to think and act in an entrepreneurial manner in the field of electrical engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
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.
Project:
- current assessment of progress in solving given engineering tasks,
- assessment of the report on the completed project related to the topic of the classes.

Programme content

Lectures:
Tasks and functions of elements of electric power system protection (EAZ), VT"s, CT"s, 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.
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.
Project:
Calculation of basic quantities of selected power grid parameters in the context of power system protections. Practical protection criteria - EAZ layout design for a small fragment of the network.

Teaching methods

Lectures:
- 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:
- group work,
- demonstrations,

- detailed review of the reports (by teacher) and discussion of the comments.
Project:
- demonstrations,
- classes conducted in an interactive way, with significant participation of students,
- theory presented in close connection with practice.

Bibliography

Basic
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
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

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	6,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	4,00