

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Zabezpieczenia sieci ŚN**
 Name in English: **MV Network security**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Electrical Power Engineering**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ELR042213**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):			30		
Number of hours of total student workload (CNPS):			60		
Form of crediting:			crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:			2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:			1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has properly founded and structured knowledge needed to understand the purposes and targets of modern power system protection units.
2. Has knowledge necessary if about working criteria and application techniques for control and regulation in power system elements under malfunction and steady work
3. Is able to correctly connect, coordinate and exploit single input relays and power safety units
4. Is able to correctly install, setup and execute exploitation checking for basic regulation and control units used in power

SUBJECT OBJECTIVES

- C1. Acquaintance with modern solutions for power safety units for MV networks
 C2. Gaining practical knowledge and skills for setting up tripping values for selected criteria of MV lines protection units depending on network arrangement
 C3. Gaining practical skills to apply modern methods, techniques and measuring tools for safety automation investigation
 C4. To gain practical knowledge and skills needed for creating protocols from measurements
 C5. Competence development in SCADA applications (communication protocols, hubs, dispatch centers)

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:**relating to skills:*

- PEK_U01 Is able to connect protection equipment to voltage, current, ground fault and control circuits of MV line model
 PEK_U02 Is able to select proper setup tripping values for protection relays and research the characteristics of the basic protection criteria of the MV line
 PEK_U03 He has skills in establishing digital communication between power protection and compartment controller (concentrator), as part of the Control System

relating to social competences:

- PEK_K01 Is conscious about responsibility for his own work and is willing to acknowledge teamwork rules

PROGRAMME CONTENT

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of safety regulations and internal regulations of laboratory. Assessment rules. Overview of laboratory stations and physical models of protection units and criterions for protection of MV lines	2
Lab 2	Overview of work and functionality of digital protection relays tester	2
Lab 3	Overview of construction and work methodology of digital MV line protection	4
Lab 4	Programming relays	2
Lab 5	Testing of selected MV line protection - determining of characteristics for basic criterions	8
Lab 6	Communication between devices using MODBUS protocol	2
Lab 7	Local Dispatcher position	2
Lab 8	GOOSE communication - IEC61850 standard communication	2
Lab 9	MMS communication - IEC61850 standard communication	2
Lab 10	DNP3 protocol communication with Remote Dispatcher	2
Lab 11	Completing arrears, completing the course	2
Total hours:		30

TEACHING TOOLS USED

N1. Laboratory with measurements on physical models of protection devices, traditionally arranged

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Examination of preparation for laboratory exercises and activity during laboratory
F2(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Assessment of prepared protocols from measurements
P(L)	$P = 0,3F1 + 0,7F2$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Winkler W., Wiszniewski A., Automatyka zabezpieczeniowa w systemach elektroenergetycznych, WNT, Warszawa, 2004
- [2] Synal B., Elektroenergetyczna automatyka zabezpieczeniowa : podstawy, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2003

SECONDARY LITERATURE:

- [1] Wróblewski J., Zespoły elektroenergetycznej automatyki zabezpieczeniowej : zasady budowy, WNT, Warszawa, 1993

SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR042213 - MV Network security
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Electrical Power Engineering**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01	S2EEN_U11	C.1 C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5	N.1
PEK_U02	S2EEN_U11	C.1 C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5	N.1
PEK_U03	S2EEN_U11	C.4	Lab6 Lab7 Lab8 Lab9 Lab10	N.1
PEK_K01	K2ETK_K02	C.1 C.2 C.3 C.4 C.5	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11	N.1