

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **PLC oraz bezprzewodowa komunikacja dla potrzeb monitoringu i pomiarów**  
 Name in English: **PLC and Wireless Communications for Monitoring and Metering**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable): **Control in Electrical Power Engineering**  
 Level and form of studies: **2nd level, full-time**  
 Kind of subject: **optional**  
 Subject code: **ELR042234**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30				15
Number of hours of total student workload (CNPS):	90				30
Form of crediting:	examination				crediting with grade
For group of courses mark (X) final course:					
Number of ECTS points:	3				1
including number of ECTS points for practical (P) classes :					1
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10				0.70

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Student has structured and theoretically founded knowledge necessary to understand phenomena related with as wire as well as wireless processing and transmission
2. Has a basic knowledge on electromagnetic field theory
3. Is able to apply properly knowledge of modern physics to analyze the efficiency of operation of communication systems employed in monitoring and metering
4. Is able to exploit properly common rules and laws of physics to the qualitative and quantitative analysis of an engineering issues
5. Able to conduct work in a team and understands the need for continuous education

**SUBJECT OBJECTIVES**

- C1. Acquaintance with basic knowledge necessary to understand phenomena accompanying both wire and wireless transmission of analog and digital signals  
 C2. Acquaintance with opportunities to use PLC technique and wire communication in monitoring and metering  
 C3. Creation of skills and ability to use PLC and wireless communication for monitoring and metering in automated electric power systems  
 C4. The acquisition of a knowledge related on current trends in signal transmission technology for industrial applications

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

- PEK\_W01 Has knowledge on physical basis of operation, implementation and use of PLC technology  
 PEK\_W02 Has knowledge on physical basis of operation, implementation and use of both wire and wireless telecommunication technology

*relating to skills:*

- PEK\_U01 Able to extract information from literature and database on selected problem in field of reliability of PLC technology and/or wireless telecommunication for selected monitoring and metering systems  
 PEK\_U02 Has the ability of analyzing the results and formulating conclusions, as well as preparation and delivering presentation

*relating to social competences:*

- PEK\_K01 Has a sense of responsibility for his own work and willingness to comply with the principles of teamwork

## PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Acquaintance with the subject and requirements of completion	2
Lec 2	PLC and wireless telecommunication tasks, basic functions	2
Lec 3	Standardization of PLC technology – advantages and disadvantages	2
Lec 4	Architecture of electric network, modeling of electric devices, layered architecture OSI	2
Lec 5	Transmission channel functionality, synchronization, frame control, management, frame priorities	2
Lec 6	Overview of network security issues	2
Lec 7	Network mode functionality, master-slave, peer-to-peer, centralized	2
Lec 8	Areas of application, voice, video, multimedia, equipment for different modems, PLC modems	2
Lec 9	Coupling problems; transformers and metering devices	2
Lec 10	Choice of transmission cabling	2
Lec 11	Application problems of selected sensors	2
Lec 12	Control of environment conditions and automated meter reading	2
Lec 13	Architecture of LAN and WAN wireless networks, advantages and disadvantages	2
Lec 14	Architecture of LAN and WAN wire networks, advantages and disadvantages	2
Lec 15	Repetition and discussion of exam issues	2
Total hours:		<b>30</b>

Form of classes - seminar		Number of hours:
Sem 1	Acquaintance with program, requirements and way of completion	1
Sem 2	Individual projects and presentations (with use of audiovisual techniques) on application of PLC and telecommunication networks	14
Total hours:		<b>15</b>

## TEACHING TOOLS USED

- N1. Lecture with use of audiovisual techniques, multimedia presentation, transparencies.  
 N2. Seminar with use of audiovisual techniques, multimedia presentation, transparencies  
 N3. Discussion on presented material

## 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(w)	PEK_W01 PEK_W02 PEK_K01	Written exam
P(w)	P=F1	
F1(s)	PEK_U01 PEK_U02 PEK_K01	Individual performance evaluation
F2(s)	PEK_U01 PEK_U02 PEK_K01	Assesment of student activities during seminar
P(s)	P=0,8F1+0,2F2	

## PRIMARY AND SECONDARY LITERATURE

### PRIMARY LITERATURE:

- [1] Xavier Carcelle, Power Line Communication in Practice, Artec House, Boston London 2006  
 [2] Yang Xiao, Yi Pan, Emerging Wireless LANs, Wireless PANs, Wireless MANs, Willey&Sons, Inc. Pub. 2009

### SECONDARY LITERATURE:

- [1] Selected papers published in recognized international journals and/or presented in internet

## SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
**ELR042234 - PLC and Wireless Communications for Monitoring and Metering**  
 AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**  
 AND SPECIALIZATION **Control in 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_W01	S2CPE_W15	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec15	N.1
PEK_W02	S2CPE_W15	C.2	Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1
PEK_U01	S2CPE_U14	C.3 C.4	Sem1 Sem2	N.2 N.3
PEK_U02	S2CPE_U14	C.3 C.4	Sem1 Sem2	N.2 N.3
PEK_K01	K2ETK_K06	C.1 C.2 C.3 C.4	Lec1 Lec15 Sem1 Sem2	N.1 N.2 N.3