

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Automatyka inteligentnego budynku**  
 Name in English: **Intelligent building automation**  
 Main field of study (if applicable): **Industrial Control Engineering**  
 Specialization (if applicable): **Automation and Control in Electrical Power Systems**  
 Level and form of studies: **2nd level, full-time**  
 Kind of subject: **obligatory**  
 Subject code: **APR012312**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		15	30	
Number of hours of total student workload (CNPS):	30		30	60	
Form of crediting:	crediting with grade		crediting with grade	crediting with grade	
For group of courses mark (X) final course:					
Number of ECTS points:	1		1	2	
including number of ECTS points for practical (P) classes :			1	2	
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		0.70	1.40	

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

1. He has a basic knowledge concerning the electrical installations of municipal buildings.
2. He knows how to use basic computer hardware and software.
3. He can obtain information from literature, databases and other sources.
4. He understands the need of continuous education and knows possibilities of improving professional, personal and social competencies.

**SUBJECT OBJECTIVES**

- C1. Getting to know basic principles of the functioning and organization of building automation systems as a part of intelligent building.
- C2. Acquiring knowledge in the field of topology, physical and logical structure of chosen solutions of intelligent installation systems.
- C3. Getting to know of basic software tools used for configuration of selected building automation systems.
- C4. Acquiring practical abilities of planning and launching simple arrangements of intelligent installations in chosen building automation systems with using products of various manufacturers.
- C5. Getting to know broad principles of design of electrical installations in municipal buildings.
- C6. Getting to know criteria and principles of intelligent installations design on the example of chosen building automation systems.
- C7. Acquiring and strengthening social competencies concerning the ability of cooperating in the team, simultaneously self-dependence, responsibility and reliability in the proceedings, awareness of effects of engineering actions taken.

**SUBJECT LEARNING OUTCOMES***relating to knowledge:*

- PEU\_W01 He knows the fundamental assumptions of the building automation and the system technology of intelligent installations.  
 PEU\_W02 He has a general knowledge of the construction and operation of selected intelligent installation systems.

*relating to skills:*

- PEU\_U01 He is able to use the acquired knowledge to create design for an intelligent installation in the chosen building automation system. He can program, put into operation, test the installation and make changes in the operation of the arrangement.  
 PEU\_U02 He can design and select the elements of a traditional electrical installation in municipal buildings.  
 PEU\_U03 He can design and select the elements of an intelligent installation in chosen buildings automation systems.

*relating to social competences:*

- PEU\_K01 He is able to collaborate with the team on the accomplishment of assumed tasks.

## PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Introduction to the course and presentation of credit conditions. Preliminary information about the building automation, system technology of intelligent installation and intelligent building. Basic definitions and classifications.	2
Lec 2	General characteristics of the KNX system. Topology of the KNX system. The division and construction of the bus devices and system components. The physical addresses of the individual system elements.	2
Lec 3	The logical structure of the KNX system and group addresses. Logical connections between communication objects and the address groups. Examples of applications and practical implementation of selected control functions.	2
Lec 4	General characteristics of the LCN system. The internal structure of the module, system components, system topology. Division and types of system devices.	2
Lec 5	The logical structure of the LCN system. Examples of applications and practical implementation of selected control functions.	2
Lec 6	Wireless solutions of intelligent installation systems.	2
Lec 7	Unconventional ways to implement building automation (eg. relay systems, PLC).	2
Lec 8	Final colloquium.	1
Total hours:		<b>15</b>

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of the rules of Procedure Health and Safety (PHS) and discussing internal regulations of laboratory. Presentation of the course credit conditions. Familiarize students with the laboratory stands.	2
Lab 2	Installation in the KNX system.	2
Lab 3	Installation in the KNX system.	2
Lab 4	Installation in the LCN system.	2
Lab 5	Installation in the LCN system.	2
Lab 6	Additionally selected installations of building automation systems.	2
Lab 7	Additionally selected installations of building automation systems.	2
Lab 8	Final classes - crediting.	1
Total hours:		<b>15</b>

Form of classes - project		Number of hours:
Proj 1	Introduction to the course. Presentation of the course credit conditions. Distribution of project tasks. Discussion of the range of the basic regulations and standards for the design of electrical installations and intelligent installations in municipal buildings.	2
Proj 2	Principles of planning the electrical installation and determining of the power demand requirements in the selected building.	2
Proj 3	Guidelines concerning sizing and equipping the electrical installations in municipal buildings. Selection of cables, wires and protection devices in the distribution network.	2
Proj 4	Selection of wires and protection devices in chosen electrical installation circuits. The content and principles for the preparation of technical project documentation in the field of conventional electrical installations.	2
Proj 5	Guidelines concerning equipping the intelligent electrical installations. Planning of the basic and advanced control functions in the selected building.	2
Proj 6	Selection of equipment necessary for the implementation of the planned control functions on the example of one chosen building automation system.	2
Proj 7	Design of planned control functions using elements of the chosen building automation system.	2
Proj 8	Design of planned control functions using elements of the chosen building automation system.	2
Proj 9	Design of planned control functions using elements of the chosen building automation system.	2
Proj 10	The content and principles for the preparation of technical project documentation for the chosen building automation system.	2
Proj 11	Selection of equipment necessary for the implementation of the planned control functions on the example of the second selected building automation system.	2
Proj 12	Design of planned control functions using elements of the chosen building automation system.	2
Proj 13	Design of planned control functions using elements of the chosen building automation system.	2
Proj 14	Design of planned control functions using elements of the chosen building automation system.	2
Proj 15	The content and principles for the preparation of technical project documentation for the second selected building automation system. Comparison of proposed intelligent installations options with use of both systems.	2
Total hours:		<b>30</b>

### TEACHING TOOLS USED

- N1. Information lecture with use of audio-visual techniques.
- N2. A multimedia presentation.
- N3. Discussion.
- N4. Software tools to design and programming the intelligent installations.
- N5. Laboratory exercises conducted in groups of students.
- N6. Personal consultations.
- N7. Develop the reports of performed exercises.

### EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

<b>Evaluation</b> <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	<b>Educational effect number</b>	<b>Way of evaluating educational effect achievement</b>
F1(W)	PEU_W01 PEU_W02	Colloquium
P(W)	P = F1	
F1(L)	PEU_U01	Oral questions or pre-test (preparation for classes)
F2(L)	PEU_U01 PEU_K01	Activity on classes
F3(L)	PEU_U01 PEU_K01	Report from laboratory exercises
P(L)	$P = 0,5F1 + 0,3F2 + 0,2F3$	
F1(P)	PEU_U02 PEU_U03	Discussion
F2(P)	PEU_U02 PEU_U03	Evaluation of the project preparation
F3(P)	PEU_U02 PEU_U03	Project defence
P(P)	$P = 0,2F1 + 0,3F2 + 0,5F3$	

### PRIMARY AND SECONDARY LITERATURE

#### **PRIMARY LITERATURE:**

- [1] Markiewicz H.: Instalacje elektryczne, WNT, current edition;
- [2] Selected standards and regulations of subject literature;
- [3] Selected websites of the manufacturers of building automation systems, according to the Supervisor's recommendation;

#### **SECONDARY LITERATURE:**

- [1] Duszczyk K., Dubrawski Andrzej, Dubrawski Albert, Pawlik M., Szafrński M.: Inteligentny budynek. Poradnik projektanta, instalatora i użytkownika, Wydawnictwo Naukowe PWN, 2019;
- [2] Klajn A., Bielówka M.: Instalacja elektryczna w systemie KNX/EIB, Informacje o Normach i Przepisach Elektrycznych - Miesięcznik Stowarzyszenia Elektryków Polskich, Podręcznik dla Elektryków - Zeszyt 10, Warszawa 2006;

### SUBJECT SUPERVISOR

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