FACULTY W-8 / DEPARTMENT……

SUBJECT CARD

Name in Polish: Informatyczne systemy sterowania
Name in English: Computer Control Systems
Main field of study (if applicable): Informatyka
Specialization (if applicable): ………….
Level and form of studies: 1st/ ~~2nd~~* level, full-time / ~~part-time~~*
Kind of subject: obligatory / ~~optional~~ / ~~university-wide~~*
Subject code INZ0298W, INZ0298L, INZ0298P
Group of courses ~~YES~~ / NO*

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30	15	
Number of hours of total student workload (CNPS)	30		90	30	
Form of crediting	Examination / ~~crediting with grade~~*	Examination / crediting with grade*	~~Examination /~~ crediting with grade*	~~Examination /~~ crediting with grade*	Examination / crediting with grade*
For group of courses mark (X) final course					
Number of ECTS points	2		2	1	
including number of ECTS points for practical (P) classes	0		2	1	
including number of ECTS points for direct teacher-student contact (BK) classes	1,2		1,2	0,6	

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge on functions of computer's main components and registers.
2. Knowledge on functions of operating systems and on structure and operation principles of PC computers operating systems.
3. Knowledge on Ethernet local area network communication protocol.
4. Knowledge on how process dynamics can be modeled using a differential equation or a transfer function.

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SUBJECT OBJECTIVES

C1 Acquiring basic knowledge on problems, methods and technologies of industrial process control – as a main implementation area for real-time computer systems.

C2 Acquiring skills in developing computer systems supporting simple control tasks, in particular – skills in setting up and configuring equipment as well as in designing and implementing control algorithms, user's interfaces and communication procedures in distributed environments.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Student can characterize typical structures of control systems.

PEK_W02 Student can formulate a stabilization problem and present a selected stabilization algorithm in a closed-loop system.

PEK_W03 Student knows definitions and examples of real-time systems, and the SFC method for modeling transitions in event systems, is able to present architecture and operation principles of a selected real-time operating system.

PEK_W04 Student can characterize equipment of computer control systems, in particular – can describe architecture, operation principle and programming languages of PLCs as well as describe PLCs' properties specific to real-time systems.

PEK_W05 Student is able to describe a selected communication mechanism of distributed computer control systems and explain its important real-time properties in comparison to a selected communication mechanism of distributed computer systems with no real-time requirements.

relating to skills:

PEK_U01 Student follows rules for using laboratory equipment.

PEK_U02 Student is capable of applying a dedicated software to perform simulation of a control algorithm and analyze the results.

PEK_U03 Student is capable of implementing interface to a control system, in a form of synoptic table/operator's panel, and implement it using SCADA software.

PEK_U04 Student is capable of configuring and programming PLC, and of calculating its cycle time.

PEK_U05 Student is able to connect and configure component devices of a distributed computer control system and implement communication between them over an industrial network.

PEK_U06 Student is able to specify control tasks, to select components of a computer control system, to recommend control algorithms as well as technologies for process data collection and visualization – based on user's requirements expressed verbally.

relating to social competences:

PEK_K01 Student is familiar with current trends in technological development of computer control systems, understands the need for learning new solutions and minimizing costs.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec1	Introduction. Control problem, control system, typical structures of control systems.	1
Lec2, Lec3	Closed-loop control. Stability. Closed-loop control algorithms.	3
Lec3, Lec4	Real-time systems and control systems. Real-time operating systems.	3
Lec5	Hierarchical structure of a distributed computer control system.	1
Lec5, Lec6	Programmable controllers PLC.	3
Lec7	Industrial computer networks.	2

Lec8	Sensors and A/C, C/A converters.	2
	Total hours	15

Form of classes - class		**Number of hours**
Cl 1		
Cl 2		
Cl 3		
Cl 4		
..		
	Total hours	

Form of classes - laboratory		**Number of hours**
Lab1	Explaining safety rules (BHP training). Introduction.	1
Lab1 – Lab6	Using SCADA software – defining variables, downloading process data, data visualization and manual control with operators panel.	11
Lab7 – Lab11	Using MATLAB/Simulink software for simulation, analysis and design of control algorithms.	10
Lab12 – Lab15	Data exchange technologies in control systems. Linking SCADA and Matlab software environments. Using OPC software tools.	8
	Total hours	30

Form of classes - project		**Number of hours**
Proj1	Introduction. Familiarization with PLC structure and software development packages for Windows.	1
Proj2 – Proj4	Implementing LOGO! PLC control programs and S7-200 PLC control programs for control tasks specified by a teacher. Setting up and putting in operation the corresponding control systems developed by individual students.	6
Proj5 – Proj8	Design, implementation, setting up and putting in operation of distributed control systems developed by student teams.	7
Proj8	Presentations of the developed control systems.	1
	Total hours	15

Form of classes - seminar		**Number of hours**
Sem 1		
Sem 2		
Sem 3		
…		
	Total hours	

TEACHING TOOLS USED

N1. Traditional lecture.
N2. Students individual work – solving computational exercises.
N3. Group work – discussion, conversation with an individual student.
N4. Students individual work – programming.
N5. Students individual work – performing computer simulations.
N6. Students individual work – studying literature.
N7. Students individual work – analyzing, designing.
N8. Students individual work – presenting.
N9. Students individual work – setting up and configuring devices..

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1 – F4	PEK_U01, PEK_U03	Watching students actions. Short (ca. 4 min) conversations with individual students concerning current laboratory exercises (incl. presentation of computer programs, computed results and conclusions), a report.
F5 – F8	PEK_U01, PEK_U02	Watching students actions Short (ca. 4 min) conversations with individual students concerning current laboratory exercises (incl. presentation of computer programs, computed results and conclusions), a report.
F9 – F10	PEK_U01, PEK_U02, PEK_U03	Watching students actions. Short (ca. 4 min) conversations with individual students concerning current laboratory exercises (incl. presentation of computer programs, computed results and conclusions), a report.
F11, F12	PEK_U01, PEK_U04	Watching students actions. Short (ca. 4 min) conversations with individual students concerning current laboratory exercises (incl. presentation of computer programs, computed results and conclusions), a report.
F13	PEK_U05, PEK_U06	On the basis of: conversations on current effects of project works, a report, a presentation.
P1 (Lec)	PEK_W01 – PEK_W05	Written examination.
P2 (Lab)	PEK_U01, PEK_U02, PEK_U03	F1 – F10
P3 (Proj)	PEK_U01, PEK_U04,	F11 – F13

	PEK_U05, PEK_U06	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Users' manuals and programmers' guides for PLC LOGO! and PLC S7-200 (available on-line)
[2] Wonderware InTouch - users' manual (available on-line)

SECONDARY LITERATURE:

[1] Bubnicki Z.: *Modern control theory*, Springer Verlag, Heidelberg-Oxford-N. York, 2005.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Jerzy Józefczyk, jerzy.jozefczyk@pwr.wroc.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

Computer Control Systems

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY

Informatyka

AND SPECIALIZATION ……_____……..

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 (knowledge)	K1INF_W15	C1	Lec1	N1
PEK_W02	K1INF_W15, K1INF_W21 K1INF_U05	C1	Lec2, Lec3	N1
PEK_W03	K1INF_W10, K1INF_W21 K1INF_U05	C1	Lec3, Lec4	N1
PEK_W04	K1INF_W08, K1INF_W21 K1INF_U05	C1	Lec5, Lec6, Lec8	N1
PEK_W05	K1INF_W11, K1INF_W21	C1	Lec5, Lec7	N1
PEK_U01 (skills)	K1INF_U14	C2	Lab1 – Lab15, Proj1 – Proj8	N1, N3, N9
PEK_U02	K1INF_U05, K1INF_U14, K1INF_U15	C2	Lab7 – Lab15	N3, N4, N5, N6, N7
PEK_U03	K1INF_U05, K1INF_U06, K1INF_U14, K1INF_U15, K1INF_U18	C2	Lab1 – Lab6, Lab12 – Lab15 Proj5 – Proj8	N3, N4, N6, N7
PEK_U04	K1INF_U05, K1INF_U14, K1INF_U18	C2	Lec6, Proj1 – Proj8	N1, N2, N3, N4, N6, N9
PEK_U05	K1INF_U05, K1INF_U08, K1INF_U14, K1INF_U18	C2	Lec6, Lec7, Proj1 – Proj8	N1, N3, N4, N6, N9
PEK_U06	K1INF_U05, K1INF_U06, K1INF_U13, K1INF_U15, K1INF_U18	C2	Lec2, Lec3, Lec5 – Lec8, Lab1 – Lab6, Proj5 – Proj8	N1, N3, N4, N6, N7, N8, N9
PEK_K01 (competences)	K1INF_K01, K1INF_K02	C1, C2	Lec2 – Lec8, Proj5 – Proj8	N1, N3, N6, N7

** - enter symbols for main-field-of-study/specialization educational effects

*** - from table above