

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Inteligentne systemy pomiarowo-sterujące**
 Name in English: **Smart Measuring and Control Systems**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable):
 Level and form of studies: **1st level, full-time**
 Kind of subject: **optional**
 Subject code: **ARR043216**
 Group of courses: **NO**

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

- He has a basic knowledge of metrology and measurement units, knows basic metrological characteristics of measuring instruments, are knowledgeable about the design of measurement known calculation methods used in developing the measurement results
- He has a basic knowledge of the measurement technique
- He knows the concepts of programming in C / C + +. He can write C/C++ program
- He/she is able to do basic measurements of electrical devices using analog and digital oscilloscope. Can set on the basis of measurements of nonlinear characteristics of the elements. Able to present the results in the form of numerical tables and graphics to make their interpretations and draw conclusions

SUBJECT OBJECTIVES

- Acquisition of basis knowledge in the field of architecture test and measurement systems.
- Understanding the methodology for designing a industrial control and measurement systems.
- Learning how the practical implementation of measurement systems computer managed by an integrated software environment and includes standard interfaces and measuring instruments in GUI environment
- Acquisition and consolidation of social skills including emotional intelligence skills involving the cooperation of a group of students with a view to effective problem solving. Responsibility, honesty and fairness in the procedure observance force in academia and society.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 He has knowledge of the architecture of test and measurement systems.
 PEK_W02 He or she has knowledge in the construction of hardware layer and system programming in high level languages.
 PEK_W03 He or she knows and understands the design methodology of control and measurement systems

relating to skills:

- PEK_U01 He or she has skills practical implementation of measurement systems computer managed by an integrated development environment dedicated
 PEK_U02 Can design position measurement testując containing standard interfaces and devices.
 PEK_U03 He or she has skills practical implementation of virtual measurement system

relating to social competences:

- PEK_K01 He or she is aware of their own responsibility for their work and a willingness to comply with the principles of teamwork. He searches information and its critical analysis, properly identifies and resolves the dilemmas of working in the profession

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	The structure and organization of measurement systems. Software of measurement systems - an integrated software environment, discussion of the workings of graphical interfaces	2
Lec 2	Structure and operation of digital multimeter	2
Lec 3	Function and Arbitrary Waveform Generator	2
Lec 4	Serial Interfaces in Measurement systems	2
Lec 5	Using instrument's driver and dedicated software in order to collecting instrument data.	2
Lec 6	Data acquisition board and oscilloscope board	2
Lec 7	GPIO (IEEE-488) Interface	2
Lec 8	Final test	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of the safety rules and principles of assessment laboratory. Presentation of laboratory	2
Lab 2	Introduction to the programming environment, VISA and window that allows you to send and receive messages from the measuring devices. Construction of the device ID. Grammar and statement SCPI commands	2
Lab 3	Construction of the user panel and the diagram. Running and debugging program in GUI	2
Lab 4	Introduction to the SCPI command tree of oscilloscope and generator. Control the instruments using a Instrument Driver or SCPI command	2
Lab 5	Introduction to the SCPI command tree of DMM and Power supply. Control instruments using a Instrument Driver or SCPI command	2
Lab 6	Implementation of the task - automatic determination of v-i characteristics	2
Lab 7	Implementation of the task - automatic determination of filter magnitude-frequency characteristic	2
Lab 8	Summary	1
Total hours:		15

TEACHING TOOLS USED

- N1. Traditional Lecture with audio-visual techniques
 N2. Laboratory run in the traditional manner of exercises + student groups, a report

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_W03	assesment/test
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Assessment of task done during laboratory activities
P(L)	P=F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Winięcki W., Organizacja komputerowych systemów pomiarowych, Oficyna wydawnicza Politechniki Warszawskiej, Warszawa 1997.
- [2] Mielczarek W.- Urządzenia pomiarowe i systemy kompatybilne ze standardem SCPI - Helion 1999
- [3] Nawrocki W.- Rozproszone systemy pomiarowe- WKŁ 2006
- [4] Świsulski D- Komputerowa technika pomiarowa. Oprogramowanie wirtualnych przyrządów pomiarowych w LabVIEW - PAK 2005
- [5] Świsulski D- Komputerowa technika pomiarowa w przykładach - PAK 2002
- [6] Tłaczala W.: Środowisko LabVIEW w eksperymencie wspomaganym komputerowo. WNT, Warszawa 2002
- [7] Jurkowski A., Maćkowski M., Michalak S., Pająkowski J., Wawrzyniak M., Komputerowe systemy pomiarowe - ćwiczenia laboratoryjne, Wyd. Politechniki Poznańskiej, Poznań 2007

SECONDARY LITERATURE:

- [1] Winięcki W., Nowak J., Stanik S.: Graficzne zintegrowane środowiska programowania do projektowania komputerowych systemów pomiarowo-kontrolnych. Wyd. Mikom, Warszawa 2001.
- [2] Bogusz J.: Lokalne interfejsy szeregowy w systemach cyfrowych - Wydawnictwo BTC, Warszawa 2004
- [3] Mielczarek W. Szeregowy interfejsy cyfrowe, Helion, Gliwice 1993;
- [4] Mielczarek W -USB : uniwersalny interfejs szeregowy, Helion, Gliwice 2005.
- [5] Mielczarek W - Szeregowy interfejs cyfrowy FireWire : standardy IEEE 1394., Wydawnictwo Politechnik Śląskiej, Gliwice 2010
- [6] Daniluk A.- USB : praktyczne programowanie z Windows API w C++ Helion, Gliwice 2009

SUBJECT SUPERVISOR

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**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR043216 - Smart Measuring and Control Systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Control Engineering and Robotics**

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	K1AIR_AMPU_W08	C.1 C.2 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_W02	K1AIR_AMPU_W08	C.1 C.2 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_W03	K1AIR_AMPU_W08	C.1 C.2 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_U01	K1AIR_AMPU_U08	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.2
PEK_U02	K1AIR_AMPU_U08	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.2
PEK_U03	K1AIR_AMPU_U08	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.2
PEK_K01	K1AiR_K09	C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.1 N.2