FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Techniki mikroprocesorowe w systemach pomiarowych**
Name in English:	**Microprocessor techniques in measuring systems**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	**Industrial Electrical Engineering**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**optional**
Subject code:	**ELR053310**
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):	60		30		
Form of crediting:	examination		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	2		1		
including number of ECTS points for practical (P) classes :			1		
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40		0.70		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has a basic knowledge of the industrial measurement. Knows the principles of operation of sensors in the measurement of non-electrical quantities.
2. Has organized knowledge in the scope of microprocessor system architectures.

SUBJECT OBJECTIVES

C1. To broaden and organize knowledge in the scope of microprocessor transducers and devices for measuring the electrical and non-electrical quantities used in standard and special measuring systems.

C2. To acquire the ability to formulate and solve problems related to modelling virtual measuring systems

C3. To acquire the ability to integrate knowledge in the fields of metrology, control engineering, electronics and data transmission

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01	Has broadened and organized knowledge in the scope of structure and architecture of microprocessor transducers of electrical and non-electrical quantities.
PEU_W02	Has deepened knowledge in the scope of data transmission and acquisition in the devices and systems for measuring the electrical and non-electrical quantities
PEU_W03	Has organized knowledge in the scope of smart measuring transducer usage.

relating to skills:

PEU_U01	Has the ability to formulate and solve problems related to modelling, designing and studying real measuring systems
PEU_U02	Has the ability to integrate knowledge in the fields of metrology, control engineering, electronics and measurement data transmission

relating to social competences:

PEU_K01	Has the ability to think and act in a creative and entrepreneurial manner. Has the ability to adequately assign priorities related to implementation of a given task.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	Smart Transducer – definitions, structure, standardization, applications	2
Lec 2	Static and dynamic characters	2
Lec 3	Signal Conditioning - OPAMP	2
Lec 4	Signal Conditioning - processing of A/D and D/A	2
Lec 5	Microcontrollers in Smart Transducer	2
Lec 6	Model ISO/OSI, Wireless Transmission	2
Lec 7	Data Acquisition	2
Lec 8	Environmental graphic design of instruments and measurement systems	2
Lec 9	Microprocessors in industrial measuring systems – standard CAN	2
Lec 10	Microprocessors in industrial measuring systems – standard MODBUS, physical layer	2
Lec 11	Microprocessors in industrial measuring systems – standard PROFIBUS, HART	2
Lec 12	Microprocessors in industrial measuring systems – standard LonWorks, PLC - transmission	2
Lec 13	Smart Transducer - examples of applications of systems for measuring electrical quantities and non- electrical, part I	2
Lec 14	Smart Transducer - examples of applications of systems for measuring electrical quantities and non- electrical, part II.	2
Lec 15	Examples of applications of systems and smart transducer for measuring.	2
	Total hours:	**30**

Form of classes - laboratory		**Number of hours:**
Lab 1	Health and Safety Regulations, laboratory of assessment rules. Introduction to Programming in LabVIEW	1
Lab 2	Get DAC	2
Lab 3	Virtual measuring of temperature part I - creating SubVI	2
Lab 4	Virtual measuring of temperature part II - graphics	2
Lab 5	Plotting waveform functions, modify charts	2
Lab 6	Smart transducer - communication (LabVIEW, etc.)	2
Lab 7	Acquisition and analysis of measurement data	2
Lab 8	Summary of activities	2
	Total hours:	**15**

TEACHING TOOLS USED
N1. Traditional lectures using audiovisual techniques
N2. Laboratory test conducted exercises in student groups
N3. Consultation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02 PEU_W03	Examination
P(W)	P=F1	
F1(L)	PEU_U01 PEU_U02 PEU_K01	Rating tasks performed during laboratory classes
P(L)	P=F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Lysik P.T., Inteligentna technika pomiarowa. Politechnika Radomska,Wydawnictwo Radom 2001
[2] Nawrocki W., Rozproszone systemy pomiarowe. WKiŁ sp. z oo., Warszawa 2006
[3] Tłaczała W., Środowisko LabVIEW w eksperymencie wspomaganym komputerowo, WN-T, Warszawa

SECONDARY LITERATURE:

[1] Nawrocki W., Komputerowe systemy pomiarowe. WKiŁ sp. z oo., Warszawa 2002, 2006
[2] Świsulski D., Komputerowa technika pomiarowa. Oprogramowanie wirtualnych przyrządów pomiarowych w LabVIEW. Agenda Wydawnicza PAK-u, Warszawa, 2005
[3] Chruściel M., LabVIEW w praktyce, Wydawnictwo BTC, Legionowo 2008
[4] http://www.LabVIEW.pl
[5] http://www.modbus.pl
[6] http://www.ni.com
[7] http://www.profibus.org.pl

SUBJECT SUPERVISOR

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