

Subject name and code	The virtual measurement instruments						
Field of study	Electrical Engineering						
Level of studies	undergraduate studies	Type of subject	elective				
Mode of study	Full-time studies	Mode of delivery	at the university				
Year of study	3	Language of instruction	English				
Semester of study	5	ECTS credits					
Learning profile	general academic profile	Assessment form	assessment				
Conducting unit	Department of Metrology and Information Systems -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Beata Pałczyńska					
	Teachers						
Lesson type and method of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study	SUM	
	Number of study hours	15		2.0	15.0	32	
Subject objectives	Introduce students with the methods and tools for programming of virtual measurement systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		

Subject contents	<p>Lectures. The virtual instrument (VI) as a generous trend in measurement instrumentation. The conception of the virtual measuring instruments. The structure and the organization of computer-based measuring systems. The basis functional blocks. The measurement system configuration. The programming panels. The graphical user interface. The hardware of VIs. The multi-function data acquisition board DAQ - construction and applications. DAQ signals, The signal conditioning. The interface standards in measuring system. The system interface bus. The serial interface. Measuring systems based on IEC-625 interface. The software environment for development of measurement systems. Introduction to LabVIEW development environment, graphical programming language G, Virtual Instrument as basic module of creating application in G language. Integration of VIs to computer network. VIs working under RTOS. Design and implementation of VIs, practical aspects. Advantages and disadvantages of VIs - analysis of development.</p>											
Prerequisites and co-requisites	Basic knowledge on electrical metrology.											
Assessment methods and criteria	<table border="1" data-bbox="438 501 1474 613"> <thead> <tr> <th data-bbox="438 501 790 539">Subject passing criteria</th> <th data-bbox="790 501 1136 539">Passing threshold</th> <th data-bbox="1136 501 1474 539">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="438 539 790 577">Final test</td> <td data-bbox="790 539 1136 577">60.0%</td> <td data-bbox="1136 539 1474 577">50.0%</td> </tr> <tr> <td data-bbox="438 577 790 613"></td> <td data-bbox="790 577 1136 613"></td> <td data-bbox="1136 577 1474 613"></td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Final test	60.0%	50.0%			
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Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Winiecki W.: Organizacja komputerowych systemów pomiarowych, Oficyna Wydawnicza PW, Wyd. 1, Warszawa 1997. 2. Świsulski D.: Komputerowa technika pomiarowa, Agenda Wydawnicza PAK, Warszawa 2005. 3. Lesiak P., Świsulski D.: Komputerowa technika pomiarowa w przykładach, Agenda Wydawnicza PAK, Warszawa, 2002. 										
	Supplementary literature	<ol style="list-style-type: none"> 1. Wells L.: LabVIEW Student Edition User`s Guide, Prentice Hall. 2010 										
	eResources addresses;	http://www.ni.com										
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Characterize a virtual instrument concept. 2. Describe a data acquisition path in a typical computer-based measurement system 3. The serial interface basic characteristics. 4. The parallel interface basic characteristics. 5. The principles of using standard interfaces like RS-232, USB, GPIB to configure a virtual measurement system controlled by a PC. 6. The principles of designing DAQ measurement system. 											
Work placement	Not applicable											