



## Subject card

Subject name and code	The programming of distributed measurement systems, PG_00044111						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group					
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			2.0		
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 types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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	30		5.0		15.0	50
Subject objectives	Introducing the principles of the organization of distributed measurement systems (DMS), with particular emphasis on network systems (NDMS). Ability to use major techniques used in DMS software. Formation of skills in the field of NDMS software, fully based on the graphical interface of the G language, which is the basis for programming in the LabVIEW graphical environment (National Instruments).						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_K05	The student knows the rules of the safe operation of measuring instruments.			[SK1] Assessment of group work skills		
	K6_K01	The student knows the basics of programming in a graphical programming environment. The student selects the tools appropriate to the measurement task.			[SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	<p><b>Lectures:</b> The organization of the distributed measurement system (DMS). Main techniques using the possibilities of the dispersion of the measurement system. The hardware architecture of the DMS. The special requirements of programming of the DMS. The design methodology of distributed measurement systems in the integrated programming environment LabVIEW. LabVIEW communication techniques for network distributed applications: communication methods, implementing communication tasks. The data transfer; non-deterministic (LabVIEW Shared Variable, Low Level Protocols (TCP/UDP), Data Socket); deterministic (NI Time-Triggered Variables, Reflective Memory). The remote application automation (VI Server). Communication tasks (data streaming, remote user interface, automating execution of remote system, Closed-loop control over Ethernet).</p> <p><b>Laboratory:</b> Practical aspects of DMS network programming in the LabVIEW environment. Analysis of the design task, determining the requirements for the system, design stages. Preparation of applications that control the transfer of measurement results between computers in the network, using the functions from the Data Communication palette.</p> <p>Launch of SRSP built on the basis of one of the following technologies: Data Socket Write-Read, TCP Open-Close Connection, Network Streams, Shared Variables.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 833 794 860">Subject passing criteria</th> <th data-bbox="801 833 1139 860">Passing threshold</th> <th data-bbox="1145 833 1482 860">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 869 794 891">Lecture - test</td> <td data-bbox="801 869 1139 891">60.0%</td> <td data-bbox="1145 869 1482 891">20.0%</td> </tr> <tr> <td data-bbox="456 900 794 922">Laboratory - running application</td> <td data-bbox="801 900 1139 922">60.0%</td> <td data-bbox="1145 900 1482 922">80.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Lecture - test	60.0%	20.0%	Laboratory - running application	60.0%	80.0%
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Lecture - test	60.0%	20.0%										
Laboratory - running application	60.0%	80.0%										
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<ol style="list-style-type: none"> <li>1. Winiński W.: Organizacja komputerowych systemów pomiarowych, Oficyna Wydawnicza PW, Wyd. 1, Warszawa 1997.</li> <li>2. Świsulski D.: Komputerowa technika pomiarowa, Agenda Wydawnicza PAK, Warszawa 2005.</li> <li>3. Lesiak P., Świsulski D.: Komputerowa technika pomiarowa w przykładach, Agenda Wydawnicza PAK, Warszawa, 2002.</li> <li>4. Haasz, V., ed. Advanced Distributed Measuring Systems: Exhibits of Application. Vol. 8. River Publishers, 2012.</li> </ol> <p>Wells L.: LabVIEW Student Edition User's Guide, Prentice Hall. 2010</p> <p>Adresy na platformie eNauczanie:</p>										
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Characterize a DMS concept.</li> <li>2. Describe an exemplary structure of the DMS.</li> <li>3. List communication methods using in the DMS.</li> <li>4. Describe features of Data Socket Technology</li> <li>5. Describe features of TCP/IP Technology</li> <li>6. Describe features of LabVIEW Shared Variable</li> <li>7. Describe features of Network Data Streaming</li> </ol> <p>The student designs the DMS in group. Starts the application that controls the transfer of measurement results between computers in the network, which is presented during a short presentation.</p>											
Work placement	Not applicable											