



## Subject card

Subject name and code	Nonelectric Measurements, PG_00048076						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Kalinowski					
	Teachers	dr inż. Paweł Kalinowski mgr inż. Kamil Osiński mgr inż. Ignacy Rogoń					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60	5.0		60.0	125	
Subject objectives	Learnig of students basic issues in the non-electrical measurements						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum		The student defines the basic metrological issues in the measurement of non-electric quantities - classifies the measurement methods - explains the principles of operation of basic, selected techniques, measurement procedures			[SW1] Assessment of factual knowledge	
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment		The student is able to follow the instructions, layout of the measuring system and perform characteristic measurements of non-electric transducers and analyze the results obtained			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment	

Subject contents	1. Basic concepts - measured quantity, measuring sensor and system, accuracy of measurements 2. Measuring sensors - classification, figures of merit 3. Determination of dynamic properties of transducers. 4. Resistance sensors in measurement circuits 5. Measurements of strain - strain gages 6. Basic limitations of strain gages, measurements of pressure 7. Inductance sensors and applications 8. Capacitance sensors and applications 9. Measurement circuits of impedance sensors 10. Force and pressure measurements 11. Flow measurements 12. Code transducers 13. Optoelectronic transducers - thermal detectors 14. Optoelectronic transducers - photon detectors 15. Position and motion measurements 16. Seismic measurements 17. Shock and vibration measurements 18. Piezoelectric accelerometers 19. Charge sensors 20. Charge transducers - limitations and measurement circuits 21. Temperature reference measurements 22. Thermoresistors 23. Thermocouples 24. Semiconductor temperature sensors 25. Quartz and special purpose thermometers 26. Introduction to optical pyrometry 27. Monochromatic, radiation and multispectral pyrometers 28. Humidity sensors 29. Microsystems MEMS, MEOMS 30. Microsystems - applications		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	50.0%	80.0%
	Laboratory	50.0%	20.0%
Recommended reading	Basic literature	J. S. Wilson, Sensor Technology Handbook, Elsevir 2005, electronic version too.	
	Supplementary literature	No recommendations.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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