SYLLABUS

Course description

Course code	Course	Metrologia i systemy pomiarowe
ME/O/I/NST/B7		Metrology and measurement systems
Language of instruction		English
Academic year		2025/2026
field of study:		Mechanical Engineering
field of specialisation:		All
Educational level		first-cycle studies
Education profile		General academic
Mode of study		Part-time studies
Semester(s)		II
Affiliation with a group of classes		B. Group of obligatory course core subject
Course status		Obligatory

Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits
	Lecture	16[h]	3 ECTS
	Classes	[h]	
	Lab	12[h]	

Linkage of the course	with the education profile	Related to the conducted scientific activity in the discipline to which the field of study is assigned	ECTS
	with qualifications	It is used to acquire engineering competences by the student	3ECTS
	with science discipline	Mechanical engineering	3ECTS

Form of teaching	Traditional – classes organized at the University /classes conducted using distance learning methods and techniques
Prerequisites	knowledge of mechanics (statics) and mathematics
Department	Faculty of Mechanical Engineering
Coordinator	Tomasz Mazur PhD .Eng.
The website of the basic organizational unit	http://wm.uniwersytetradom.pl
E-mail address, phone number of the coordinator	tomasz.mazur@urad.edu.pl phone :76-86

LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	C1-the purpose of the lesson is to acquire the skills to choose proper methods and strategies for measurement and assessment of measurement errors and uncertainties

Curriculum Content:	The content of the classes is related to the topics of scientific research conducted by the teachers. Lecture: main updates in fundamentals of measurement theory, definitions and basic concepts, units of measurement, types of dimensions and deviations, size tolerance, calculation/selection of standardized tolerances and deviations, calculation of gaps and indentations in shaft and hole joints, fixed hole or shaft principle, location of landings. Form and position deviations, surface roughness and 3D topography measurements. Measurement of geometrical features – types of measurements, error analysis and uncertainty estimation. Evaluation and of static and dynamic measurements, analysis of static and dynamic measurement errors. Direct, indirect, and complex measurements. Measurement systems. Coordinate measurements. Classical optimization method (in outline) using Lagrange's differential extremum. Analysis of uncertainty of direct, indirect and complex measurements, display and reading errors, calculation of partial and relative errors, calculation of random errors. Measurement systems – processing functions (Fourier transform, Laplace transform, transmission coefficient of the system operator, transmission coefficient of individual measuring elements in the system, examples of transformations). Type A and B uncertainty estimations. Measurement System Analysis (MSA). Laboratory exercises: measuring external dimensions. Measurement of internal dimensions, thread measurements Measurement of complex contours (measuring microscopes). Angle measurements. Gear wheel measurements Laboratory exercises: Measuring external dimensions. Measurement of internal dimensions, Thread measurements Measurement of complex contours (measuring microscopes). Angle measurements. Gear wheel measurements
Didactic (educational) methods:	Informational lecture (regular), practical exercises (laboratory)
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing the course is to achieve all the required learning out comes specified for the course. Lecture: a written test consisting in solving an accounting problem, taking into account the correctness of the result, the calculation method used, and the independence of work. Lab exercises: Arithmetic mean of scores with all submitted reports and possible theory tests, and all ratings must be positive

Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes				Methods of verifying learning outcomes	
Learning outcome number	Description of the learning outcomes for the course (PEU) A student who has passed the course (**W**) knows and understands / (**U**) can / (**K**) is ready to:	Field of study learning outcome (KEU)	Types of classes	Form of verification (credits)	Methods of testing and assessment
W1	Classifies geometric values in size and shape and defines the method and strategy for measuring them	K_WG12, K_WG16	Lectures	Colloquium	final notes test written documents
U1	Can perform measurements basic dimensions geometric and define uncertainty dimensions	K_UW05, K_UW06	Laboratories	Reports	Continuous + control presence
K1	aware of the consequences accepting and conducting a survey measurement strategy	K-KK01, K-KK02	Laboratories	verbal form	

Literature and teaching aids

Primary literature:
1. Raghavendra N.V., Krishnamurthy L.: Engineering Metrology and Measurements. Oxford University Press, 2013.
2. Curtis M.: Handbook of Dimensional Measurement. Industrial Press, Inc., 2013.
3. Nawrocki W.: Measurement Systems and Sensors. Artech House Publishers, 2016.
4. Figliola R.S., Beasley D.E.: Theory and Design for Mechanical Measurements. John Willey& Sons, Inc., 2015.
Additional literature:
instructions for carrying out exercises at the measurement station
Study aids:

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits		
Attendance, participation	Student workload [h].	
	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in lectures/classes/lab	X	28[h]
Preparation for lectures/classes/lab , Preparation for ... credit / exam	4 [h]	X
Total student workload	30 [h]/ 1,2ECTS	45 [h]/ 1,8ECTS
ECTS points per subject	3 ECTS	

Additional information, comments
In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate. Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych).