GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00073758		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Biomaterials Technology -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Joanna Sypniewska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

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	45	10.0	45.0	100

Subject objectives

The aim of the course is to prepare students to select and apply measurement methods and instruments in biomaterials research, independently perform measurements, and analyze the results, using knowledge of instrument operating principles, material properties, and metrology in the context of solving research problems in medical engineering.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] uses acquired analytical, simulation and experimental methods as well as mathematical models to solve engineering problems in the field of medical engineering	Is able to prepare and perform measurements of selected biomaterial properties and process the results, using experimental and analytical methods to solve a specific research problem in medical engineering.	[SU2] Assessment of ability to analyse information
[K7_U15] evaluates the feasibility of advanced methods and tools for solving complex engineering tasks of a practical nature, characteristic of the field of study, and selects and applies appropriate methods and tools for this purpose	Is able to evaluate, select, and apply measurement instruments and methods for investigating specific biomaterial properties, using an analysis of their capabilities, limitations, and metrological parameters to solve a practical research task.	[SU4] Assessment of ability to use methods and tools
[K7_W04] has structured and well-founded knowledge covering issues in the field of mechanical engineering allowing to design medical devices, rehabilitation systems and to formulate research procedures	Knows and understands the operating principles, construction, and technical parameters of selected measurement instruments used in biomaterials research in the context of developing research procedures and evaluating material properties for medical applications.	[SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>Course content – lecture

Fundamentals of metrology and operating principles of measurement instruments used in biomaterials research. Characteristics of methods for measuring the mechanical, physical, and surface properties of materials. Instrument specifications, accuracy, precision, resolution, and measurement uncertainty. Criteria for selecting measurement instruments and methods, their limitations, and principles for assessing result reliability.

Course content – laboratory

Preparation of biomaterial samples and measurement setups. Independent performance of selected measurements using available instruments in accordance with laboratory procedures and safety requirements. Processing and analysis of results, evaluation of measurement uncertainty, and identification of error sources. Comparison of measurement instrument capabilities and justification of method selection for specific research tasks.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of materials science, biomaterials, physics, and metrology, as well as the ability to perform basic measurements and interpret material testing results.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Test</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Laboratory report</td><td>60.0%</td><td>30.0%</td></tr>
<tr><td>Practical assignment documentation</td><td>60.0%</td><td>20.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Measurement Systems: Application and Design – Doebelin E. O., Manik D. N., 6th ed., McGraw-Hill, 2011.

2. Experimental Methods for Engineers – Holman J. P., 8th ed., McGraw-Hill, 2012.

3. Biomaterials Science: An Introduction to Materials in Medicine – Ratner B. D. i in. (red.), 4th ed., Academic Press, 2020.</td></tr>
<tr><td>Supplementary literature</td><td>An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements – Taylor J. R., 2nd ed., University Science Books, 1997.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Which measurement instruments are used to investigate biomaterial properties? What are the operating principles and main technical parameters of selected instruments? How can an appropriate measurement method be selected for a specific research problem? How should samples and measurement setups be prepared?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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