GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00073759		
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	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	15.0	55.0	100

Subject objectives

The aim of the course is to prepare students to design research procedures, select evaluation methods, and analyze the properties of dental biomaterials, based on knowledge of dental materials, their interactions with oral tissues, and their performance in the oral environment, in the context of formulating and testing research hypotheses related to restorative dentistry, prosthodontics, and implantology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] has structured and well-founded knowledge covering issues in the field of medical engineering allowing to design medical devices, rehabilitation systems and to formulate research procedures	Knows and understands the properties and testing methods of dental composites, cements, dental ceramics, and implant materials in the context of engineering research procedures for evaluating dental biomaterials.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K7_W02] has structured and well-founded knowledge covering fundamental issues in the field of medical sciences allowing to design medical devices, rehabilitation systems and to formulate research procedures	Knows and understands the anatomical, physiological, and biological conditions affecting the use of dental biomaterials and the principles of evaluating their interactions with oral tissues in the context of developing research procedures for restorative dentistry, prosthodontics, and implantology.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K7_U02] formulates hypotheses to test research problems in the field of medical engineering	Is able to formulate testable research hypotheses concerning the properties and durability of dental biomaterials, using research problem analysis and the selection of experimental methods for hypothesis testing.	[SU1] Assessment of task fulfilment
[K7_U03] uses knowledge related to diagnostic techniques, medical and rehabilitation procedures, anatomy and physiology to formulate assumptions referring to design and research procedures	Is able to develop a testing procedure for a dental biomaterial, using knowledge of oral anatomy and physiology and the requirements of dental procedures to select testing conditions, evaluation parameters, and measurement methods.	[SU3] Assessment of ability to use knowledge gained from the subject

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

Characteristics of biomaterials used in restorative dentistry, prosthodontics, and implantology, including resin composites, dental cements, dental ceramics, and implant materials. Material requirements arising from masticatory loading, saliva exposure, pH fluctuations, and biofilm formation. Methods for evaluating the mechanical, surface, and biological properties of dental materials and principles of designing research procedures that account for clinical conditions.

Course content – laboratory

Preparation of dental biomaterial specimens and performance of selected material property tests using available laboratory equipment. Analysis and interpretation of results in relation to the requirements of restorative dentistry, prosthodontics, or implantology. Formulation of research hypotheses, experimental planning, and development of material evaluation procedures considering oral conditions. Preparation of laboratory documentation and research conclusions.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of materials science, biomaterials, oral anatomy and physiology, as well as the ability to 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>Research Procedure Documentation</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Test</td><td>60.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Anusavice K. J., Shen C., Rawls H. R., Phillips' Science of Dental Materials, 12th ed., Elsevier, 2013.

Powers J. M., Wataha J. C., Dental Materials: Foundations and Applications, 11th ed., Elsevier, 2017.</td></tr>
<tr><td>Supplementary literature</td><td>ISO 4049:2019, Dentistry — Polymer-based restorative materials.</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 properties of dental composites determine their suitability for tooth restoration? How can methods for testing the strength, hardness, and wear resistance of dental materials be selected? How do artificial saliva, pH changes, and thermal cycling affect the durability of dental biomaterials?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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