GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Materials Engineering in Sports, PG_00072443		
Field of study	Materials Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group Humanistic-social subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Michał Strankowski	
	Teachers	dr hab. inż. Michał Strankowski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

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	15	1.0	9.0	25

Subject objectives

The objective of the course is to prepare students to analyze and evaluate the application of modern polymer and composite materials in sports based on knowledge in the field of materials engineering and social sciences, as well as to shape attitudes related to the responsible and conscious use of material technologies in the context of their impact on performance, safety, and equity in sports.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W09] Has general knowledge of humanities, social or economic sciences, covering their basics and applications.	The student can analyze problems related to the use of polymer and composite materials in sports, applying knowledge from social sciences to assess their impact on users and the sports environment.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U12] Can apply the knowledge of humanities, social sciences or economics to problem solving.	The student is ready to consciously use social knowledge in analyzing material applications in sports, in particular through participation in discussions on the ethical and social consequences of material innovations.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	The student is ready to develop competences in materials engineering in sports by identifying their own limitations and using expert opinions when analyzing technological problems.	[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice

Subject contents

Course content – lecture

1. Introduction to materials engineering in sports

- The role of materials in the development of modern sports
- The importance of material innovations for sports performance and safety

2. Modern polymer materials in sports

- Characteristics of polymers used in sports equipment and clothing
- Functional properties (lightness, strength, flexibility, resistance to environmental conditions)

3. Polymer composites in sports applications

- Structure and classification of composites (e.g., carbon, glass, aramid fibers)
- Advantages of composites over traditional materials

4. Application of materials in various sports disciplines

- Endurance sports (e.g., cycling, running)
- Strength and technical sports (e.g., skiing, motorsports)
- Team sports (e.g., football/soccer, basketball)
- Water and extreme sports

5. Impact of materials on athletes' performance and safety

- Ergonomics and comfort of use
- Injury reduction and body protection

6. Social and ethical aspects of using new materials in sports

- Technological "doping" (limits of technological assistance)
- Technology availability vs. equity in sports

7. Sustainable development and ecology of sports materials

- Recycling of polymers and composites
- Environmental impact of sports equipment production

8. Examples of material innovations in sports (case studies)

- Analysis of selected solutions (e.g., athletic footwear, professional equipment)
- Impact of innovations on sports regulations

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Problem test (W1, knowledge)	60.0%	30.0%
Case study analysis, written report (U1, skills)	60.0%	40.0%
Active participation in discussion (K1, social competences)	60.0%	30.0%

Recommended reading

Basic literature	1. Materials in Sports Equipment M. Jenkins (comprehensive overview of materials used in sports, including polymers and composites) 2. Materials and Technology in Sports M. Jenkins (impact of materials on sports performance and technology development) 3. Handbook of Polymer Applications in Medicine and Medical Devices I. Ahmed (excerpts regarding functional applications; performance properties of polymers analogous to sports applications) 4. Composite Materials: Science and Engineering K.K. Chawla (fundamentals of composites used in sports equipment)
Supplementary literature	1. Sport Technology: History, Philosophy and Policy A. Miah (social and ethical context of technology in sports) 2. The Science of Sport: Performance Enhancement and Equipment T. Reilly (impact of technology and materials on sports performance) 3. Introduction to Polymers R.J. Young, P.A. Lovell (scientific fundamentals of polymers) 4. Engineering Materials 1 M.F. Ashby, D.R.H. Jones (material properties and selection, also in the context of sports applications)
eResources addresses	

Example issues/ example questions/ tasks being completed

1. What is the difference between an amorphous polymer and a semi-crystalline polymer?
2. What properties of elastomers determine their use in athletic footwear?
3. Provide examples of polymers used in sportswear and justify their choice.
4. Compare the properties of PU and EVA in the context of athletic footwear cushioning.

Practical activites within the subject	Not applicable

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