

1. Field of study	Materials Science and Engineering
2. Faculty	Faculty of Science and Technology
3. Academic year of entry	2025/2026 (winter term)
4. Level of qualifications/degree	first-cycle studies (in engineering)
5. Degree profile	general academic
6. Mode of study	full-time
7. ISCED code	0715 (Mechanics and metal trades)
8. Number of semesters	7
9. Degree	inżynier (Engineer - Bachelor's Degree with engineering competencies)
10. General characteristics of the field of study and the assumed concept of education	Materials engineering is an interdisciplinary field of study that combines knowledge from fundamental sciences such as mathematics, physics, and chemistry to gain a deeper understanding of the relationship between the structure and properties of engineering materials. The harmonious integration of knowledge from these fundamental sciences allows students to build a solid theoretical foundation for acquiring practical skills in efficient shaping, manufacturing, designing, and modelling engineering materials with precisely defined properties that determine their applications. The concept of education in the field of materials engineering is based on many years of own experience strengthened by cooperation with partners from the economic and industrial, scientific and educational sectors, both in Poland and abroad. It is entirely consistent with the Development Strategy of the University of Silesia in Katowice for 2020-2025 and the Development Strategy of the Institute of Materials Science and Engineering for 2020-2025. Thanks to this synergy, the educational program provides students with up-to-date knowledge, skills and competencies necessary to meet the labour market requirements and responds to scientific and technological challenges. The curriculum of the Materials Engineering program enables students to acquire skills and competencies that encompass both interdisciplinary general education in materials science and specialized knowledge in the shaping, manufacturing, design, modelling, and selection of engineering materials suitable for specific applications. Additionally, students gain advanced practical knowledge and professional preparation in one of their chosen specializations: Innovative Engineering Materials or Biomaterials. Students have the opportunity to actively participate in creating and developing materials that have broad applications in various fields, including, but not limited to, medicine, aviation, and automotive industries. Including an individualized area-focused learning path allows students to tailor their study program to their interests. It enables them to view materials engineering from different perspectives while fostering their creativity and ability to collaborate with specialists from various fields. By transcending the boundaries of individual disciplines, students can leverage knowledge from different areas of science to create innovative and effective solutions. The modern labour market requires candidates for engineering positions to have an increasingly wide range of skills, such as analytical thinking, teamwork, problem-solving, decision-making, creativity, adaptation to changing working conditions, interpersonal communication, knowledge of foreign languages, as well as the ability to use IT tools and new technologies. In order to meet these requirements, materials engineering students have the opportunity to acquire knowledge and skills in various areas directly related to their field of study, as well as enable more straightforward navigation in a complex and demanding professional environment. The New Study Concept, giving students the freedom to choose their education path and enabling the adaptation of the curriculum to individual interests and future career plans, is implemented in the study programme of Materials Engineering through: - possibility to choose one of two specialities: Innovative Engineering Materials or Biomaterials. The indicated specializations allow students to gain in-depth knowledge of the selected subject, and the specialist modules offered within the specialization focus on current

	research problems and achievements in the discipline of materials engineering. Students have the opportunity not only to learn about the latest technologies and innovative engineering materials but also to participate in research carried out at the University of Silesia. Thanks to such interaction with academic teachers actively carrying out scientific research and access to modern research infrastructure, students have a chance to develop cognitive, research and practical skills and apply the acquired knowledge in real projects in the field of materials engineering. - a choice of eight programme co-related modules. Programme co-related modules are multi-faceted support for directional education. As part of the modules offered at this level of education, students have the opportunity to enrich their professional education by participating in modules from other disciplines. The choice of area modules allows students to understand better and use the various connections between their knowledge and competencies related to materials engineering and knowledge and methodology appropriate for other disciplines. Programme co-related modules allow looking at materials engineering from different perspectives, contributing to students' comprehensive development and flexibly broadening their ability to apply knowledge in practice. - possibility to choose modules from the Open Access Modules offer. The offer is not a fixed set of modules but is modified, considering the changing needs of students and new areas in modern knowledge. The study program in Materials Engineering has implemented an innovative approach following the New Concept of Studies at the University of Silesia in Katowice. This approach combines the transmission of current knowledge and the development of practical skills essential for engineering work, thus creating a rational understanding of the world. Thanks to this concept, graduates of Materials Engineering are prepared for effective adaptation in the job market, in line with the requirements of the contemporary professional environment. A graduate of Materials Engineering is open to new ideas and ready for the challenges that arise from the dynamic development of technology and materials. They can identify problems and find creative ways to solve them. With their flexibility and a willingness for continuous growth, they can quickly adapt to dynamically changing professional conditions. Their ability to effectively collaborate with specialists from various fields makes them a leader in projects that require interdisciplinary cooperation. With their skills, they can introduce innovative solutions on a large scale, contributing to technological and social progress. The monitoring of the effectiveness of the education program and identification of areas that require improvement are carried out in the field of Materials Engineering through the implementation of procedures within the Internal Quality Assurance System of Education. Systematic monitoring of the effectiveness of the education program ensures that graduates are equipped with appropriate knowledge, skills, and competencies that enable them to solve problems and engage in innovative projects effectively, thus responding to the scientific and technological challenges of the rapidly evolving field of materials engineering.
11. Information on the relationship between the studies and the university's strategy as well as the socio-economic needs that determine the conduct of studies and the compliance of learning outcomes with these needs	The concept of education in Materials Engineering is based on many years of our own experience, reinforced by cooperation with partners from the economic-industrial, scientific, and educational sectors, both domestically and abroad. It is entirely in line with the Development Strategy of the University of Silesia in Katowice for 2020-2025 and the Development Strategy of the Institute of Materials Engineering for 2020-2025. Thanks to this synergy, the educational program provides students with up-to-date knowledge, skills, and competencies necessary to meet the demands of the job market and address scientific and technological challenges. The participation of the University of Silesia in the competition under the Excellence Initiative - Research University program signifies the adoption of priority operational goals aimed at raising the level of scientific research and the quality of education, thereby enhancing the international significance of the University. Within this initiative, the University of Silesia focuses on developing five Priority Research Areas linked to today's civilisation's key challenges. A crucial goal is to enhance the quality of education for students in fields and disciplines related to the Priority Research Areas. Implementing two specialisations in Materials Engineering, namely Innovative Engineering Materials and Biomaterials directly relates to

		the Priority Research Areas defined in the University of Silesia Development Strategy for 2020-2025. The specialisation of Biomaterials is closely related to Priority Research Area No. 1: Harmonious Human Development - caring for health and quality of life. Graduates of this specialisation possess interdisciplinary knowledge about advanced biomaterials and extensive skills in shaping, manufacturing, designing, modelling, and selecting materials for medical applications. This enables them to engage in research and development projects in this field. With the acquired skills, they are able to co-create solutions that have a direct impact on improving the quality of life. The specialisation in Innovative Engineering Materials is closely related to two Priority Research Areas (POAs): Area 2 - Advanced materials and technologies and their sociocultural implications, and Area 3 - Environmental and climate changes and their associated social challenges. Graduates of this specialisation possess interdisciplinary knowledge about advanced, innovative materials, production methods, and research into their properties that determine their range of applications. The information conveyed during the educational process inspires creative thinking and problem-solving related to materials engineering. As a result, graduates can effectively collaborate with specialists from other fields, contributing to the development and implementation of innovative material solutions in various industrial sectors, including addressing adverse climate changes. Implementing the New Study Concept in Materials Engineering strengthens the connection between the field and Priority Research Areas. This is achieved by introducing eight specialised modules into the curriculum, allowing for crossing boundaries between individual disciplines and utilising knowledge from various scientific areas to create innovative and effective solutions. The New Study Concept in Materials Engineering encourages an interdisciplinary perception of the surrounding reality. The didactic process in Materials Engineering utilises various forms of internationalisation of education (internationalisation at home). For example, foreign language education is implemented throughout the entire teaching cycle, and academic teachers from the country and foreign institutions conduct classes. This education is carried out within selected modules, particularly as part of the Materials Science and Engineering program, aimed at both domestic and international students. An essential aspect of initiatives related to the internationalisation of education in materials engineering is promoting student mobility and the mobility of staff involved in the teaching process through the use of the Erasmus program, one of Europe's most recognised student mobility programs. Undertaking actions related to acquiring international educational projects is of significant importance for further developing various forms of internationalisation of education in materials engineering. During classes in Materials Engineering, various teaching methods are used, such as expository, problem-based, interactive, practical, and self-learning methods. This creates a diverse and interactive learning environment. The catalogue of teaching methods outlined in the Course Syllabus is not a closed set, allowing instructors to freely choose and apply optimal teaching methods tailored to the needs of the group and the level of difficulty of the content being conveyed. The university provides infrastructure that enables classes to be conducted in various forms, including those utilizing the latest information and communication technologies. The teaching process in the field of Materials Engineering is systematically monitored, and the achieved outcomes are verified through the implemented procedures of the Internal Education Quality Assurance System.
12.	Specializations	Biomaterials Innovative Engineering Materials
13.	General description of the specialization	<u>Biomaterials</u> The Biomaterials specialization in Materials Engineering is an interdisciplinary educational path that enables students to acquire advanced knowledge for understanding the relationship between the structure and properties of materials used in medicine, particularly in their application in the production of implants and medical devices. Students pursuing this specialization have the opportunity to familiarize themselves with various groups of biomaterials and the latest trends in biomaterials engineering. The curriculum of this specialization also concerns the limitations and challenges associated with using biomaterials in medical practice. Students gain a solid

theoretical foundation necessary for acquiring practical skills in efficiently shaping, manufacturing, designing, and modelling materials with precisely defined properties that determine their application in medicine.

Within four specialized modules, students have the freedom to choose the subject matter in which they want to expand their knowledge of biomaterials. Consequently, there is an opportunity for development in specific areas of interest associated with individual ambitions and career goals. The specialized modules offered to students are related to the current research topics conducted at the University of Silesia, with particular emphasis on the research theme carried out at the Institute of Materials Engineering.

For example, students may deepen their knowledge of creating "core-shell" composite materials, which will help them understand their properties and potential applications in medicine. Another proposed topic is the production and modification of porous materials based on titanium, enabling the acquisition of skills in designing and optimizing medical implants. Students can also opt to develop competencies in polymer materials as platforms for the controlled release of therapeutic substances, allowing them to design innovative therapeutic solutions. It is also possible to delve into the knowledge of hybrid materials based on shape memory NiTi alloy and bio-compatible protective coatings to acquire skills in increasing the bioactivity, biocompatibility, and long-term stability of metallic implants.

It is worth emphasizing that the subject matter of specialized modules within the Biomaterials specialization is regularly updated to reflect the dynamic development of innovative biomaterials, manufacturing technologies, and the latest scientific trends and discoveries. Therefore, students have the opportunity to acquire up-to-date knowledge in the field of the latest advancements in biomaterials and participate in ongoing research at the Institute of Materials Engineering.

Innovative Engineering Materials

Specialization in Innovative Engineering Materials in Materials Engineering is an educational path that allows students to acquire advanced knowledge to understand the relationships between the structure and properties of materials used in various industries. This interdisciplinary specialization introduces students to the world of advanced materials and their applications, encouraging creative thinking and problem-solving in materials engineering. In a rapidly evolving world, where the continuous discovery of new materials is an integral part of technological progress, materials engineers must be capable of thinking outside the box and proposing innovative solutions. Students pursuing the educational program in Innovative Engineering Materials specialization gain a solid theoretical foundation for acquiring practical skills in efficiently shaping, manufacturing, designing, and modelling materials with precisely defined properties that determine their application.

Within four specialized modules, students have the freedom to choose the subject matter in which they want to expand their knowledge of biomaterials. Consequently, there is an opportunity for development in specific areas of interest associated with individual ambitions and career goals. The specialized modules offered to students are related to the current research topics conducted at the University of Silesia, with particular emphasis on the research theme carried out at the Institute of Materials Engineering.

For example, students can choose to deepen their knowledge of multifunctional materials and new methods of manufacturing dielectric, piezoelectric, pyroelectric, and ferroelectric materials, which find applications in electronics and mechatronic technology, as well as composite materials with shape memory effect used in multi-range and multi-level thermal switches. Additionally, they can delve into the subject of researching advanced engineering materials for tribological and aerospace applications, as well as acquire knowledge in the field of manufacturing techniques and developing comprehensive methods for modifying new hybrid materials based on magnesium, titanium, and corrosion and wear-resistant titanium alloys, as well as nickel-based superalloys with enhanced structural resistance at high temperatures.

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14.	The semester from which the specializations starts	3
15.	Percentage of the ECTS credits for each of the scientific or artistic disciplines to which the learning outcomes are related to the total number of ECTS credits (along with the indication of the leading discipline)	Biomaterials: • <i>[leading discipline]</i> materials engineering (engineering and technology): 100% Innovative Engineering Materials: • <i>[leading discipline]</i> materials engineering (engineering and technology): 100%
16.	Number of ECTS credits required to achieve the qualification equivalent to the level of study	210
17.	Percentage of the ECTS credits for optional modules in relation to the total number of ECTS credits	Biomaterials: 57%, Innovative Engineering Materials: 57%
18.	Total number of ECTS credits that a student must obtain in the modules taught	Biomaterials: 124, Innovative Engineering Materials: 124
19.	Number of ECTS credits that a student must obtain in modules assigned to disciplines within the humanities or social sciences (not less than 5 ECTS) - in the case of fields of study assigned to disciplines within the fields other than, respectively, humanities or social sciences	Biomaterials: 6, Innovative Engineering Materials: 6
20.	Number of ECTS credits - higher than 50% of the total number of credits - that a student must obtain:	Biomaterials: 168, Innovative Engineering Materials: 168

	- in general university programmes within a module connected with research carried out in the scientific or artistic disciplines to develop his/her knowledge and research skills; - in practical programmes within a module to develop practical skills	
21.	Total number of ECTS credits that a student must obtain in internships	Biomaterials: 6, Innovative Engineering Materials: 6
22.	Internships (hours and conditions) in the case of practical programmes and in general university programme - if such requires internship	Internships are an integral part of the study program, carried out by students in individual fields, levels, profiles and forms of study. Internships are to help in confronting the knowledge acquired during studies with the requirements of the labour market, acquiring skills useful in the profession, learning about practical issues related to working in positions for which the student is prepared during the course of studies. The internship is to familiarize the student with professional language relevant to a specific industry and work culture. The rules for the organization of internships are set out in the Rector's ordinance. Detailed rules of apprenticeship taking into account the specifics of particular fields of study are set out in the field's of study apprenticeship regulations, in particular: learning outcomes assumed to be achieved by the student during the apprenticeship, framework apprenticeship program including a description of issues, dimension of apprenticeship (number of weeks of practice); form of internship (continuous, mid-year), criteria for choosing the place of internship, obligations of the student staying in the internship, obligations of the academic tutor, conditions for completing the internship by the student and conditions for exemption from the internship obligation in whole or in part. The number of ECTS and the number of hours are specified in the course structure.
23.	Graduation requirements	The condition for admission to the diploma examination is to achieve the learning outcomes provided for in the study program, to obtain a certificate of an appropriate level of language proficiency in a foreign language and to obtain positive grades for the diploma dissertation. The condition for graduation is to pass the diploma examination with at least a satisfactory result. A graduate receives a higher education diploma confirming obtaining the qualifications of the appropriate degree. Detailed rules of the diploma process and the requirements for the diploma thesis are set out in the Rules and Regulations of Studies at the University of Silesia and the diploma regulations.