



Lodz University
of Technology

Study programme

Faculty:	Faculty of Electrical, Electronic, Computer and Control Engineering
Major:	Biomedical Engineering and Technologies (in English)
Level of study:	first-cycle programme (inżynier)
Form of study:	full-time studies
Academic year:	2026/27

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Basic information

Name of the field of study:	Biomedical Engineering and Technologies (in English)
Level of study:	first-cycle programme (inżynier)
Study profile:	general academic
Form of studies:	full-time studies
Duration of studies (number of semesters):	7
The number of ECTS points required to complete studies:	210
Total number of hours of classes:	2678
The number of ECTS points a student obtains as part of classes conducted with the direct participation of academic teachers or other persons conducting classes:	107
Professional title awarded to graduates:	inżynier
ISCED code:	0788
Language of study:	English

Assigning the course to the disciplines to which the learning outcomes relate

Discipline	Percentage share
Technical computing and telecommunications	70%
Material Engineering	20%
Biomedical engineering	10%

Learning outcomes (in relation to the PQF)

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
1	1BET1	Knows and understands, at an advanced level, the methods and tools in mathematics, physics, computer science, biomedical sciences and materials engineering necessary for the analysis, modeling and synthesis of complex biomedical systems, including systems for acquiring, processing and analyzing medical data and solutions using biomaterials and functional structures used in medical devices.	P6U_W	P6S_WG
2	1BET10	Is ready to apply the principles of professional ethics and engineering responsibility in the design, implementation and use of biomedical systems, in particular in the areas of patient safety, medical data protection and compliance with legal regulations.	P6U_K	P6S_KR
3	1BET2	Knows and understands the operation, construction and integration of complex biomedical systems, including medical electronics, software, signal and image processing, and biomaterial and textronic components, taking into account environmental, economic, legal and ethical conditions.	P6U_W	P6S_WG, P6S_WK, P6S_WG_inž, P6S_WK_inž
4	1BET3	Is able to acquire, select and critically evaluate technical and medical information in order to make responsible engineering decisions in the area of biomedical engineering, including the design and evaluation of medical systems and devices.	P6U_U	P6S_UW, P6S_UW_inž
5	1BET4	Is able to plan and conduct experiments, tests and simulation studies on signals, images, biomedical systems and properties of biomaterials, interpret the obtained results and, based on them, assess the performance, quality and safety of the designed solutions.	P6U_U	P6S_UW, P6S_UW_inž
6	1BET5	Is able to identify, analyze and solve complex and unusual biomedical engineering problems, taking into account technical, nontechnical, clinical and functional requirements.	P6U_U	P6S_UW, P6S_UW_inž
7	1BET6	Is able to design, develop, integrate, test and implement biomedical systems, including solutions in the field of biomedical informatics, medical electronics, wearable devices and systems, and components and structures made of biomaterials, using appropriate methods and tools.	P6U_U	P6S_UW, P6S_UW_inž
8	1BET7	Is able to communicate effectively with the professional environment, including medical personnel and engineers of other specialties, also in a foreign language at a level of at least B2, formulating and justifying opinions and presenting the results of design and research work.	P6U_U	P6S_UK
9	1BET8	Is able to function and collaborate in a project team, including interdisciplinary and international ones, using soft skills and tools supporting teamwork.	P6U_U	P6S_UO, P6S_UU

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
10	1BET9	Is willing to participate in engineering and research and development projects in the field of biomedical engineering and social initiatives related to health care, contributing technical knowledge, critical assessment of existing knowledge and awareness of non-technical conditions, undertaking activities in an entrepreneurial and socially responsible manner.	P6U_K	P6S_KK, P6S_KO

Matrix of course modules in relation to learning outcomes and curriculum content

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
1	Information Technology and Fundamentals of Programming		x			x			x			
2	Material Science											
3	Mathematics 1		x									
4	Physics		x									
5	Chemistry		x				x					
6	Engineering Drawing								x			
7	C1 Business Communication for Engineers 1	Selected lexical and grammatical structures; topics relevant to the academic and professional environments of university graduates; improving receptive and productive language skills; developing essential soft skills required in the workplace.								x		
8	C2 Business Communication for Engineers 1	Selected lexical and grammatical structures; topics relevant to the academic and professional environments of university graduates; improving receptive and productive language skills; developing essential soft skills required in the workplace.								x		
9	Study Skills for University	Organisation of studies at the IFE, familiarising students with the basic tools and techniques necessary in the study process and the principles of academic culture. Presenting of general educational concept of the programme of study.			x						x	
10	Advanced Programming		x						x			
11	Computer Aided Design	Parametric solid modeling, sketched and complex features. Assembly mode composed of multiple parts, defining mechanisms and recording motion sequences. Generating technical documentation.										
12	Mechanical Engineering		x									
13	Modern Physics	Fundamentals of optics: basic properties of light, electromagnetic waves, reflection, refraction, interference, and diffraction. Quantum mechanics: wave-particle duality, the Schrödinger equation, wave function and its probabilistic interpretation, basic quantum systems. Atomic structure: models of the atom, quantized energy levels, electron orbitals, and atomic spectra. Nuclear physics: structure of the atomic nucleus, radioactivity, nuclear decay, fission, and fusion processes. Special theory of relativity: postulates of special relativity, time dilation, length contraction, mass-energy equivalence. Cosmology: large-scale structure of the Universe, expansion of the Universe, Big Bang theory.	x				x					

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
14	Mathematics 2		x									
15	Measurements	Units of measurement, exact and approximate numbers, measurement errors, rounding rules, measurement methods and the measurement process, properties of instruments, data processing, properties of measuring instruments, mechanical, geometrical and electrical measurements.	x		x	x						
16	C1 Business Communication for Engineers 2	Selected lexical and grammatical structures; topics relevant to the academic and professional environments of university graduates; improving receptive and productive language skills; developing essential soft skills required in the workplace.	x			x	x					
17	C2 Business Communication for Engineers 2	Selected lexical and grammatical structures; topics relevant to the academic and professional environments of university graduates; improving receptive and productive language skills; developing essential soft skills required in the workplace.	x			x	x					
18	Civic Knowledge and Engagement I	Developing social competences that go beyond the specific learning outcomes, necessary for a conscious, empathetic and educated citizen of Poland, Europe and the world. Implementing various activities aimed at personal development, the development of the University and local communities.								x		
19	Electronics and Electrical Engineering		x			x	x					
20	Signal Processing		x				x		x			
21	Robotics		x					x	x			
22	Anatomy and Physiology		x				x					
23	Biophysics		x				x					
24	Interdisciplinary Problem-Based Learning Project	Implementation of a problem-based project during workshop classes. Teams of 4-5 people — students from different fields of study. Project topics — practical, not strictly related to a specific field of study. The classes develop students' soft skills (including creativity, teamwork, time management, problem solving) as well as the ability to use tools that support project work.						x		x	x	x
25	German A2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
26	German B1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
27	German B2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
28	Spanish A2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
29	Spanish B1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
30	Spanish B2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
31	French A2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
32	French B1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
33	French B2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
34	Italian A1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
35	Italian A2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
36	Polish A1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
37	Polish A2 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
38	German A1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
39	Spanish A1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
40	French A1 block I	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
41	Civic Knowledge and Engagement II	Developing social competences that go beyond the specific learning outcomes, necessary for a conscious, empathetic and educated citizen of Poland, Europe and the world. Implementing various activities aimed at personal development, the development of the University and local communities.										x
42	Biostatistics		x				x					
43	Image Processing and Computer Graphics		x				x		x			
44	Medical Data Repositories		x			x			x			
45	Medical Electronics				x		x		x			
46	Intellectual Property Protection and Commercialization			x	x							
47	Team Project			x		x		x	x	x	x	
48	German A2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
49	German B1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
50	German B2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
51	Spanish A2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
52	Spanish B1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
53	Spanish B2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
54	French A2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
55	French B1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
56	French B2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
57	Italian A1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
58	Italian A2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
59	Polish A1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
60	Polish A2 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
61	German A1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
62	Spanish A1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
63	French A1 block II	Selected lexical and grammatical structures at different levels; topics relevant to academic mobility within the Erasmus+ programme; improvement of all language skills; development of the necessary interpersonal competences required in an international environment.								x		
64	Civic Knowledge and Engagement III	Developing social competences that go beyond the specific learning outcomes, necessary for a conscious, empathetic and educated citizen of Poland, Europe and the world. Implementing various activities aimed at personal development, the development of the University and local communities.										x
65	Biomaterials I											
66	Biomechanical Engineering											
67	Medical Imaging		x				x		x			
68	Medical Informatics and Microsystems Technology		x			x			x			
69	Machine Learning		x		x		x		x			
70	Implants and Artificial Organs											
71	Biomedical Engineering Project			x	x		x	x	x	x	x	
72	Mobility Semester											
73	Biomaterials II		x				x		x			
74	Law and Ethics in Biomedical Engineering			x				x				x

No.	Course name	Program content	1BET1	1BET10	1BET2	1BET3	1BET4	1BET5	1BET6	1BET7	1BET8	1BET9
75	Diploma Seminar				x	x				x		x
76	Final Project		x	x		x	x	x	x			
77	Internship			x				x		x		x
78	Medical Data Bases				x		x		x			
79	Biomedical Modelling and Simulation				x		x		x			
80	Digital Accessibility and Universal Design				x		x		x			
81	Mobile Systems				x		x		x			
82	Textronics in Healthcare				x		x		x			
83	Introduction to Project Management with Elements of Project Implementation Methodology				x		x		x			
84	Biomaterials' Research Techniques				x		x		x			
85	Data Intensive Systems in Biomedicine				x		x		x			

ECTS - subjects

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
1	Information Technology and Fundamentals of Programming	6			6	6
2	Material Science	3				3
3	Mathematics 1	7				7
4	Physics	3				3
5	Chemistry	5				5
6	Engineering Drawing	2				2
7	C1 Business Communication for Engineers 1	3		3		3
8	C2 Business Communication for Engineers 1	3		3		3
9	Study Skills for University	1	1			1
10	Advanced Programming	6			6	6
11	Computer Aided Design	3			3	3
12	Mechanical Engineering	4				4
13	Modern Physics	3				3
14	Mathematics 2	7				7
15	Measurements	4			4	4
16	C1 Business Communication for Engineers 2	2		2		2
17	C2 Business Communication for Engineers 2	2		2		2
18	Civic Knowledge and Engagement I	1	1			1
19	Electronics and Electrical Engineering	5				5
20	Signal Processing	5			5	5

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
21	Robotics	4				4
22	Anatomy and Physiology	4				4
23	Biophysics	3				3
24	Interdisciplinary Problem-Based Learning Project	5				5
25	German A2 block I	3		3		3
26	German B1 block I	3		3		3
27	German B2 block I	3		3		3
28	Spanish A2 block I	3		3		3
29	Spanish B1 block I	3		3		3
30	Spanish B2 block I	3		3		3
31	French A2 block I	3		3		3
32	French B1 block I	3		3		3
33	French B2 block I	3		3		3
34	Italian A1 block I	3		3		3
35	Italian A2 block I	3		3		3
36	Polish A1 block I	3		3		3
37	Polish A2 block I	3		3		3
38	German A1 block I	3		3		3
39	Spanish A1 block I	3		3		3
40	French A1 block I	3		3		3
41	Civic Knowledge and Engagement II	1	1			1

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
42	Biostatistics	5			5	5
43	Image Processing and Computer Graphics	5			5	5
44	Medical Data Repositories	3			3	3
45	Medical Electronics	5			5	5
46	Intellectual Property Protection and Commercialization	2				2
47	Team Project	6			6	6
48	German A2 block II	3		3		3
49	German B1 block II	3		3		3
50	German B2 block II	3		3		3
51	Spanish A2 block II	3		3		3
52	Spanish B1 block II	3		3		3
53	Spanish B2 block II	3		3		3
54	French A2 block II	3		3		3
55	French B1 block II	3		3		3
56	French B2 block II	3		3		3
57	Italian A1 block II	3		3		3
58	Italian A2 block II	3		3		3
59	Polish A1 block II	3		3		3
60	Polish A2 block II	3		3		3
61	German A1 block II	3		3		3
62	Spanish A1 block II	3		3		3

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
63	French A1 block II	3		3		3
64	Civic Knowledge and Engagement III	1	1			1
65	Biomaterials I	4			4	4
66	Biomechanical Engineering	4			4	4
67	Medical Imaging	4			4	4
68	Medical Informatics and Microsystems Technology	4			4	4
69	Machine Learning	3			3	3
70	Implants and Artificial Organs	4			4	4
71	Biomedical Engineering Project	7			7	7
72	Mobility Semester	30			30	30
73	Biomaterials II	2			2	2
74	Law and Ethics in Biomedical Engineering	2	2			2
75	Diploma Seminar	3				3
76	Final Project	15		15	15	15
77	Internship	6				6
78	Medical Data Bases	2		2	2	2
79	Biomedical Modelling and Simulation	2		2	2	2
80	Digital Accessibility and Universal Design	2		2	2	2
81	Mobile Systems	2		2	2	2
82	Textronics in Healthcare	2		2	2	2
83	Introduction to Project Management with Elements of Project Implementation Methodology	2		2	2	2

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
84	Biomaterials' Research Techniques	2		2	2	2
85	Data Intensive Systems in Biomedicine	2		2	2	2

ECTS indicators

Name	Value
The total number of ECTS credits that a student must obtain through elective courses (amounting to no less than 30% of the total ECTS credits required to obtain the qualification corresponding to the given level of study)	28/210 (13.33%)
The total number of ECTS credits to be earned by a student through courses in the fields of humanities or social sciences	6
The total number of ECTS credits that a student must obtain from courses related to research conducted at the university, amounting to more than 50% of the total ECTS credits required to graduate from a given level of study	124/210 (59.05%)

Methods of verifying and assessing learning outcomes

The verification of achieved learning outcomes requires the use of diverse assessment methods appropriate to the categories of knowledge, skills, and social competencies to which these outcomes pertain. The selection of suitable tools also depends on the specific nature of the subject and the format of the classes and is described in detail in the course syllabi. The achievement of the required learning outcomes is assessed through:

1. Written assignments (exams, quizzes, reports, essays, projects, posters, thesis, etc.);
2. Oral assessments (oral exams, public speaking, e.g., delivering a paper, presentation, etc.);
3. Practical and/or project-based tasks (both individual and group work);
4. Observation and evaluation of students' participation and activity during classes;
5. Self-assessment and peer evaluation (especially in the case of group projects);
6. Competency exams and final diploma examinations.

Verification can be formative (partial, conducted multiple times during the course) and/or summative (final grade assessment). The final verification result is given according to the currently applicable grading scale.

The course coordinator or instructor is required to present the course syllabus during the first class and to clearly define and formally communicate the assessment methods and conditions for verifying learning outcomes.

Professional internships

Duration: 6 weeks

ECTS credits: 6

Internships are carried out in accordance with the study program in a format adapted to the profile and specifics of the field of study, following the regulations set by the faculty and the university.

Characteristics of the course

Graduate profile

Graduates of the first-cycle Biomedical Engineering and Technologies program possess the knowledge, skills, and engineering competencies in biomedical engineering, encompassing biomedical informatics, medical electronics, engineering biomechanics, and biomaterials engineering, with particular emphasis on the analysis, design, and use of diagnostic and therapeutic systems, biomedical signal and image processing, and the integration of medical equipment with IT systems. Thanks to the study program delivered in English and the use of modern teaching methods, including project-based and team-based work, graduates are prepared to work in interdisciplinary, international, and multicultural teams. Graduates are prepared to undertake diverse employment in healthcare settings, particularly hospitals, clinical centers, outpatient clinics, and clinics, as well as in companies involved in the design, manufacture, distribution, and accreditation of medical equipment, devices, and biomedical IT systems, research and development, consulting, and medical administration. He/she speaks a foreign language at the B2 CEFR proficiency level, including specialist terminology in the field of biomedical engineering, and is prepared to independently acquire knowledge and undertake second-cycle studies in related fields.

The relationship between the field of study and the university's strategy

Biomedical Engineering and Technologies program is consistent with the mission and strategic goals of Lodz University of Technology defined in the Development Strategy for 2025–2030, which implements the COOPERATION concept. The curriculum aligns with key areas of the strategy, particularly impact on the socio-economic environment, internationalization, innovation and technology transfer, science, and education, responding to the needs of the healthcare sector and modern medical technologies.

The educational concept combines general engineering knowledge with competencies in biomedical informatics, medical electronics, engineering biomechanics, and biomaterials engineering, emphasizing the development of analytical, design, and teamwork skills, as well as entrepreneurial attitudes. The implementation of classes using project-based methods, including in collaboration with the socio-economic environment, fosters the development of practical competencies and prepares students for the challenges of the labor market.

An important element of the University's strategy is the internationalization of education through classes conducted in English and the participation of specialists in the field of sciences. medical, which reinforces the interdisciplinary nature of the program. The targeted learning outcomes are consistent with the profile and concept of education and are within the field of engineering and technical sciences, particularly in the disciplines of technical information technology and telecommunications, as well as materials engineering, remaining fully aligned with the University's mission and strategy.

Educational objectives and employment and continuing education opportunities

The main educational objectives of the Biomedical Engineering and Technologies program are:

- a. to develop knowledge, skills, and engineering competencies in the field of biomedical engineering, in particular biomedical informatics, medical electronics, engineering biomechanics, and biomaterials engineering, with particular emphasis on the analysis, design, integration, and use of diagnostic and therapeutic systems, biomedical signal and image processing, and the use of modern information, electronic, and material technologies in healthcare;
- b. to develop competencies focused on the practical applications of biomedical technologies in diagnostics, therapy, rehabilitation, and patient monitoring, taking into account safety requirements, legal regulations, principles of professional ethics, and the sustainable development of healthcare systems;
- c. to prepare graduates for work in interdisciplinary, multicultural, and international teams combining engineering and medical competencies, as well as for effective collaboration with medical personnel in clinical and non-clinical environments.

Graduates in the Biomedical Engineering and Technologies program are prepared to work in IT companies involved in the design, implementation, and maintenance of medical information systems, in design units, Design and technology organizations developing medical equipment and products, healthcare facilities participating in the integration, operation, and maintenance of diagnostic and therapeutic systems, and research and development institutions operating at the intersection of technical and biomedical sciences. The qualifications obtained enable graduates to continue their education in second-cycle studies in biomedical engineering and other fields related to technical sciences.

Description of the process and outcome of consultations on the proposed study program with the socio-economic environment

When developing the educational concept and curriculum for the Biomedical Engineering and Technologies program, systematic consultations were conducted with representatives of the socio-economic environment, including students and graduates employed in companies operating in the field of biomedical engineering in the Łódź region (including Tricomed, AptVision, the Central Institute for Labor Protection, and MDH). These opinions allowed for the consideration of current labor market requirements and expected graduate competencies.

Members of the program's Council also participated in events organized by the Łódź ICT Cluster, which brings together IT companies operating in the Łódź region, which enabled the identification of market needs in the field of biomedical informatics and modern ICT technologies used in healthcare.

An important element of the consultations was also cooperation with national medical centers, including the Norbert Barlicki Hospital in Łódź, the Copernicus Hospital in Łódź, the Władysław Biegański Hospital in Łódź, and the University Clinical Hospital named after the Military Academy of Medicine. Medical Center – the Central Veterans Hospital in Łódź, the Clinical and Didactic Center of the Medical University of Łódź, the Jagiellonian University Medical College, and the Polish Mother's Memorial Hospital Institute in Łódź. Furthermore, the study program was consulted with companies involved in medical equipment servicing, sterilization and decontamination (Iacobus sp. z o.o.), individual orthopedic supplies, and the production of implants and implant technologies (Medgal, Proteo, Otropro). The findings from this collaboration are used to continually update the study program to ensure it meets the latest technological trends and the needs of the medical sector.

Description of competencies expected from a candidate applying for admission to studies

In accordance with the recruitment resolution for a given academic year.

The unit organizing education

Faculty of Electrical, Electronic, Computer and Control Engineering

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Information Technology and Fundamentals of Programming	Laboratory classes: 75	6	Graded assignment	Obligatory
Material Science	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Mathematics 1	Tutorials: 70 Lecture: 20	7	Exam	Obligatory
Physics	Tutorials: 15 Lecture: 30	3	Exam	Obligatory
Chemistry	Laboratory classes: 30 Project work: 10 Lecture: 30	5	Graded assignment	Obligatory
Engineering Drawing	Tutorials: 20 Lecture: 10	2	Graded assignment	Obligatory
Business Communication for Engineers 1		3	Graded assignment	Obligatory group
The student chooses one module from the group.				
C1 Business Communication for Engineers 1	Tutorials: 60	3	Graded assignment	Optional
C2 Business Communication for Engineers 1	Tutorials: 60	3	Graded assignment	Optional
Study Skills for University	Tutorials: 30	1	Pass	Obligatory
Sum	445	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Advanced Programming	Laboratory classes: 30 Project work: 30 E-learning: 10	6	Graded assignment	Obligatory
Computer Aided Design	Laboratory classes: 45	3	Graded assignment	Obligatory
Mechanical Engineering	Tutorials: 30 Lecture: 20	4	Graded assignment	Obligatory
Modern Physics	Laboratory classes: 20 Lecture: 20	3	Graded assignment	Obligatory
Mathematics 2	Tutorials: 70 Lecture: 20	7	Exam	Obligatory
Measurements	Laboratory classes: 20 Lecture: 30	4	Graded assignment	Obligatory
Business Communication for Engineers 2		2	Exam	Obligatory group
The student chooses one module from the group.				
C1 Business Communication for Engineers 2	Tutorials: 30	2	Exam	Optional
C2 Business Communication for Engineers 2	Tutorials: 30	2	Exam	Optional
Civic Knowledge and Engagement I	Seminar: 3 Lecture: 3	1	Graded assignment	Obligatory
Physical Education 1	Tutorials: 30	0	Pass	Obligatory
Sum	411	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Electronics and Electrical Engineering	Tutorials: 20 Laboratory classes: 20 Lecture: 30	5	Exam	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Signal Processing	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Obligatory
Robotics	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Anatomy and Physiology	Seminar: 15 Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Biophysics	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Interdisciplinary Problem-Based Learning Project	Project work: 30	5	Graded assignment	Obligatory
Foreign Language Block 1		3	Graded assignment	Obligatory group
The student chooses one module from the group.				
German A2 block I	Tutorials: 60	3	Graded assignment	Optional
German B1 block I	Tutorials: 60	3	Graded assignment	Optional
German B2 block I	Tutorials: 60	3	Graded assignment	Optional
Spanish A2 block I	Tutorials: 60	3	Graded assignment	Optional
Spanish B1 block I	Tutorials: 60	3	Graded assignment	Optional
Spanish B2 block I	Tutorials: 60	3	Graded assignment	Optional
French A2 block I	Tutorials: 60	3	Graded assignment	Optional
French B1 block I	Tutorials: 60	3	Graded assignment	Optional
French B2 block I	Tutorials: 60	3	Graded assignment	Optional
Italian A1 block I	Tutorials: 60	3	Graded assignment	Optional
Italian A2 block I	Tutorials: 60	3	Graded assignment	Optional
Polish A1 block I	Tutorials: 60	3	Graded assignment	Optional
Polish A2 block I	Tutorials: 60	3	Graded assignment	Optional
German A1 block I	Tutorials: 60	3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Spanish A1 block I	Tutorials: 60	3	Graded assignment	Optional
French A1 block I	Tutorials: 60	3	Graded assignment	Optional
Civic Knowledge and Engagement II	Seminar: 3 Lecture: 3	1	Graded assignment	Obligatory
Physical Education 2	Tutorials: 30	0	Pass	Obligatory
Sum	421	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Biostatistics	Laboratory classes: 15 Project work: 15 Lecture: 30	5	Exam	Obligatory
Image Processing and Computer Graphics	Laboratory classes: 15 Project work: 10 Lecture: 30	5	Graded assignment	Obligatory
Medical Data Repositories	Laboratory classes: 20 Project work: 15 Lecture: 10	3	Graded assignment	Obligatory
Medical Electronics	Laboratory classes: 15 Project work: 15 Lecture: 30	5	Graded assignment	Obligatory
Intellectual Property Protection and Commercialization	Seminar: 15 Lecture: 15	2	Graded assignment	Obligatory
Team Project	Project work: 40	6	Graded assignment	Obligatory
Foreign Language Block 2		3	Graded assignment	Obligatory group
The student chooses one module from the group.				
German A2 block II	Tutorials: 60	3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
German B1 block II	Tutorials: 60	3	Graded assignment	Optional
German B2 block II	Tutorials: 60	3	Graded assignment	Optional
Spanish A2 block II	Tutorials: 60	3	Graded assignment	Optional
Spanish B1 block II	Tutorials: 60	3	Graded assignment	Optional
Spanish B2 block II	Tutorials: 60	3	Graded assignment	Optional
French A2 block II	Tutorials: 60	3	Graded assignment	Optional
French B1 block II	Tutorials: 60	3	Graded assignment	Optional
French B2 block II	Tutorials: 60	3	Graded assignment	Optional
Italian A1 block II	Tutorials: 60	3	Graded assignment	Optional
Italian A2 block II	Tutorials: 60	3	Graded assignment	Optional
Polish A1 block II	Tutorials: 60	3	Graded assignment	Optional
Polish A2 block II	Tutorials: 60	3	Graded assignment	Optional
German A1 block II	Tutorials: 60	3	Graded assignment	Optional
Spanish A1 block II	Tutorials: 60	3	Graded assignment	Optional
French A1 block II	Tutorials: 60	3	Graded assignment	Optional
Civic Knowledge and Engagement III	Seminar: 3 Lecture: 3	1	Graded assignment	Obligatory
Physical Education 3	Tutorials: 30	0	Pass	Obligatory
Sum	386	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Biomaterials I	Laboratory classes: 30 Lecture: 30	4	Exam	Obligatory
Biomechanical Engineering	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Medical Imaging	Laboratory classes: 15 Project work: 15 Lecture: 30	4	Graded assignment	Obligatory
Medical Informatics and Microsystems Technology	Laboratory classes: 20 Lecture: 40	4	Graded assignment	Obligatory
Machine Learning	Laboratory classes: 20 Project work: 10 Lecture: 15	3	Graded assignment	Obligatory
Implants and Artificial Organs	Laboratory classes: 30 Lecture: 20	4	Graded assignment	Obligatory
Biomedical Engineering Project	Project work: 60 Lecture: 10	7	Graded assignment	Obligatory
Sum	405	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mobility Semester	Total number of contact hours: 375	30	Graded assignment	Obligatory
Sum	375	30		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Biomaterials II	Laboratory classes: 20 Lecture: 15	2	Graded assignment	Obligatory
Law and Ethics in Biomedical Engineering	Seminar: 30	2	Graded assignment	Obligatory
Diploma Seminar	Seminar: 45	3	Graded assignment + exam	Obligatory
Final Project	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Internship	Internship: 0	6	Pass	Obligatory
Elective Courses		2	Graded assignment	Obligatory group
The student chooses 1 subject				
Medical Data Bases	Laboratory classes: 20 Project work: 10	2	Graded assignment	Optional
Biomedical Modelling and Simulation	Laboratory classes: 10 Project work: 10 Lecture: 10	2	Graded assignment	Optional
Digital Accessibility and Universal Design	Project work: 20 Lecture: 10	2	Graded assignment	Optional
Mobile Systems	Laboratory classes: 10 Project work: 10 Lecture: 10	2	Graded assignment	Optional
Textronics in Healthcare	Project work: 20 Lecture: 10	2	Graded assignment	Optional
Introduction to Project Management with Elements of Project Implementation Methodology	Tutorials: 20 Lecture: 10	2	Graded assignment	Optional
Biomaterials' Research Techniques	Tutorials: 30	2	Graded assignment	Optional
Data Intensive Systems in Biomedicine	Laboratory classes: 10 Project work: 10 Lecture: 10	2	Graded assignment	Optional
Sum	140	30		