Wrocław University of Science and Technology

Study programme

Organizational unit:	Faculty of Fundamental Problems of Technology
Field of study:	Medical Informatics
Level of study:	first degree engineering
Form of study:	full-time studies
Education cycle:	2025/2026

Table of contents

Field of study characteristics

Basic information

Organizational unit:	Faculty of Fundamental Problems of Technology
Field of study:	Medical Informatics
Study level:	first degree engineering
Study form:	full-time studies
Education profile:	general academic profile
Language of study:	English
Valid from the education cycle:	2025/2026
Number of semesters:	7
Number of semesters in the English version of the programme:	7
Total number of hours of classes:	2470
Total number of ECTS points required to complete a given level of study:	210
Professional title awarded to graduates:	inżynier

Fields of science and scientific disciplines

Scientific disciplines to which the field of study is assigned:

Field engineering and technical sciences

Assigning the major to the fields and disciplines to which the learning outcomes relate:

Discipline	Percentage
Biomedical engineering	100%

Main discipline: Biomedical engineering

Description of the field, profile of the graduate and possibilities of continuing studies

Graduates have a broad knowledge of biomedical engineering and acquire a core competence in medical informatics and medical electronics. They are prepared to design and use modern medical devices for measurement, diagnostic, and therapeutic purposes. Also, they can collect and process information as well as implement, test, and maintain eHealth solutions.

Graduates can participate in research and development and can pursue graduate studies. Graduates can work for:

1. healthcare units (e.g., hospitals, outpatient clinics, clinical labs);
2. medical device companies;
3. R&D companies;
4. IT companies;
5. schools as a teacher.

Currentness of the study programme

Concept and goals of education

The programme was created for inquisitive students interested in biomedical applications of artificial intelligence, big data, mobile and wearable devices, augmented, and virtual reality. Students are encouraged to pursue their own research projects or join one of several student research clubs.

Information regarding the inclusion of socio-economic needs in the study programme and the compliance of the major learning outcomes with these needs

The rapid development of information technology in medicine is continuing. There is an ever-increasing demand for biomedical engineers with interdisciplinary knowledge of medicine, IT, and medical devices. And such knowledge and such experts are needed to meet the demands of a rapidly changing healthcare system and to adapt it to the needs of patients and medical staff.

Other important factors determining the validity of the study programme

Students can count on comprehensive classes in basic sciences such as mathematics, physics, biology, chemistry and computer science, but also about medical apparatus and anatomy and physiology. The curriculum also includes the most relevant IT fields in recent years: programming languages, data science algorithms, databases, software engineering, mobile systems, augmented and virtual reality.

The connection of the programme with the University's mission and its development strategy

The study programme was created in response to the dynamic development of biomedical engineering and information technologies. Implementing the objectives of the Strategy of Wrocław University of Science and Technology for 2023-2030 in the area of education, the programme includes two priority areas - ‘Information Technology, Data Science and Artificial Intelligence’ and ‘Technologies for Health and Medicine’. This creates opportunities for students to acquire knowledge and practical skills in an educational environment that promotes collaboration, creativity and problem-solving, as well as developing the teaching offer in response to the changing needs of both students and the modern economy, in collaboration with the social and economic environment. Educating students in English enables internationalisation and makes teaching methods more attractive. The direction allows students to acquire knowledge and skills in a creative and engaged environment, and to participate in research in strategic fields. Collaboration with the community, particularly the medical industry, provides opportunities to understand the needs of patients and professionals.

Learning outcomes

Code	Description of the directional learning outcome	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework, enabling the acquisition of engineering competences
Knowledge			
K1IBM_W01	Has corresponding knowledge of theories, facts, and methods of mathematics, physics, chemistry, electrical engineering, and electronics useful for formulating and solving simple tasks in biomedical engineering.	P6U_W, P6S_WG	
K1IBM_W02	Knows and understands to an advanced degree facts and phenomena of Medical Sciences related to Biomedical Engineering, in the fields of Anatomy, Physiology, and Propaedeutics of Medical Sciences and Biology.	P6U_W, P6S_WG	
K1IBM_W03	Has well-ordered and theoretically founded general knowledge covering key issues in biomedical engineering, in particular Biochemistry, Biophysics, Sensors and Measurement of Non-Electrical Quantities, Electronic Medical Equipment, Metrology, Fundamentals of Biophotonics, Signal Processing, and Medical Imaging Techniques.	P6U_W, P6S_WG	P6S_WG_INŻ
K1IBM_W04	Has basic knowledge of the life cycle of technical equipment and systems used in biomedical engineering including IT systems.	P6U_W, P6S_WG	P6S_WG_INŻ
K1IBM_W05	Has basic knowledge necessary to understand the social, economic, and legal aspects of engineering activities in Biomedical Engineering.	P6U_W, P6S_WK	P6S_WG_INŻ
K1IBM_W06	Has basic knowledge of management, including quality management in biomedical engineering.	P6U_W, P6S_WK	P6S_WG_INŻ
K1IBM_W07	Has knowledge of basic concepts and principles of industrial property and copyrights; can use patent information resources in the field of biomedical engineering.	P6U_W, P6S_WK	P6S_WG_INŻ
K1IBM_W08	Knows and understands the general principles of creating and developing forms of individual entrepreneurship using knowledge from the fields of science and scientific disciplines specific to biomedical engineering.	P6U_W, P6S_WK	P6S_WG_INŻ
K1IBM_W09	Has basic knowledge of engineering technologies, methods, techniques, tools, and materials used in solving simple engineering tasks in the field of biomedical engineering, with particular emphasis on methods, techniques, technologies and information technology tools.	P6U_W, P6S_WG	P6S_WG_INŻ
K1IBM_W10	Has an in-depth knowledge of object-oriented programming paradigms, database query execution and management, and machine learning and artificial intelligence; is familiar with web technologies, principles of software development for mobile devices and principles of medical information systems design.	P6U_W, P6S_WG	P6S_WG_INŻ
Skills			
K1IBM_U01	Can innovatively solve complex and unusual biomedical engineering problems under changing and not fully predictable conditions.	P6U_U, P6S_UW	
K1IBM_U02	Has the ability to self-educate.	P6U_U, P6S_UW	

Code	Description of the directional learning outcome	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework, enabling the acquisition of engineering competences
K1IBM_U03	Can use the acquired knowledge to formulate and solve complex and nontypical problems in the field of biomedical engineering and to perform tasks through proper selection of sources and information from them to evaluate, critically analyze and synthesize.	P6U_U, P6S_UW	
K1IBM_U04	Can implement clean and well-documented code.	P6U_U, P6S_UW	
K1IBM_U05	Can communicate using specialized terminology in the field of biomedical engineering; can communicate with the public, justify his/her position.	P6U_U, P6S_UK	
K1IBM_U06	Is able to participate in a debate - present, evaluate, and discuss different opinions and positions within the discipline of biomedical engineering.	P6U_U, P6S_UK	
K1IBM_U07	Can plan and organize individual and team software development.	P6U_U, P6S_UO	
K1IBM_U08	Can plan and carry out experiments including measurements and computer simulations in the field of biomedical engineering; is able to discuss results.	P6U_U, P6S_UW	P6S_UW_INŻ
K1IBM_U09	Is able to use analytical, simulation, and experimental methods to formulate and solve engineering tasks within the discipline of biomedical engineering.	P6U_U, P6S_UW	P6S_UW_INŻ
K1IBM_U10	Can see systemic and nontechnical aspects of engineering tasks in the field of biomedical engineering.	P6U_U, P6S_UW	P6S_UW_INŻ
K1IBM_U11	Is able to perform a preliminary economic analysis of biomedical engineering activities.	P6U_U, P6S_UW	P6S_UW_INŻ
K1IBM_U12	Is able to design and implement simple IT systems using mobile/web technologies and databases for biomedical engineering applications.	P6U_U, P6S_UW	P6S_UW_INŻ
Social competence			
K1IBM_K01	Is prepared to critically evaluate his/her knowledge and to seek expert advice if he/she has difficulty solving a problem independently.	P6U_K, P6S_KK	
K1IBM_K02	Is prepared to make decisions independently, to critically evaluate his own actions, actions of the teams he leads, and organizations in which he participates; accepts responsibility for the consequences of those actions.	P6U_K, P6S_KK	
K1IBM_K03	Is aware of the social role of a technical university graduate, is ready to act for the benefit of the economic and social environment.	P6U_K, P6S_KO	
K1IBM_K04	Can think and act in an entrepreneurial way; is ready to assess the importance of knowledge in solving cognitive and practical problems.	P6U_K, P6S_KO	
K1IBM_K05	Is aware of the social role of a graduate of a technical university, especially the need to formulate and convey to the society, through the mass media, information, and opinions on the achievements of technology and other aspects of engineering activities; makes efforts to convey such information and opinions in a commonly understood way.	P6U_K, P6S_KO	
K1IBM_K06	Takes care to adhere to professional ethics and requires it from others; cares about the achievements and traditions of the profession.	P6U_K, P6S_KR	
Language and physical education outcomes			
SJO_S1_U01	Be able to use a foreign language at ESCJ level B2	P6S_UK	

Code	Description of the directional learning outcome	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework, enabling the acquisition of engineering competences
SWF_S1_U01	Is aware of the importance of systematic physical activity for physical and mental health		

Detailed information on ECTS points

Medical Informatics

Name	Value
Total ECTS	210
Total number of hours of classes	2470
Number of ECTS points assigned to classes related to scientific activities conducted at the university in the discipline or disciplines to which the field of study is assigned (DN)	138/210 (65.71%)
Number of ECTS points allocated to classes developing practical skills (including laboratory, project) (P)	111.6
The number of ECTS points that a student will receive by completing classes that require the direct participation of academic teachers or other persons conducting classes and students (BU)	108.9
Percentage of ECTS for elective courses	69/210 (32.86%)
The number of ECTS points that a student will receive by completing classes in the humanities or social sciences appropriate for a given field of study	5
The number of contact hours that a student will receive by taking physical education classes	60
The number of ECTS points that a student will receive by completing classes in basic sciences (mathematics, physics/chemistry)	40

Organization of studies

Implementation of the study programme

Allowable ECTS deficit

Semester	Allowable deficit of ECTS points after a semester
Semester 1	9
Semester 2	9
Semester 3	7
Semester 4	7
Semester 5	6
Semester 6	5
Semester 7	0

Detailed requirements

All courses–credited with exam or grade–are defined by the provisions of the Rules of Study at the Wroclaw University of Science and Technology.

Methods of verifying the intended learning outcomes

Activity form	Methods of verifying the intended learning outcomes

Description of the process leading to achieving learning outcomes

The methods for checking the assumed learning outcomes during the learning process are linked to the achievement of the subject learning outcomes, which are the implementation of the more general assumed learning outcomes defined at the level of the course. Each subject charter defines the subject learning outcomes, as well as the methods and tools used to assess their achievement, for the courses included in the subject. The methods used to check and assess learning outcomes in knowledge are written or written/oral examinations, colloquia, short tests, speeches, participation in discussions. The learning outcomes in terms of skills are assessed on the basis of written reports on experimental work, the ability to solve tasks of practical application of theory in a representative range, the ability to perform simple tasks of an engineering nature. The learning outcomes in terms of social competences generally relate to the formation of the student's attitude towards the environment, such as the ability to cooperate in a team, the ability to self-educate under given conditions, self-motivation to work. Acquired social competences are most often tested and assessed as a result of observation of student performance in specific course conditions with direct contact between the lecturer and students.

Internships

After completing the internship, the student is obliged to submit to the dean's plenipotentiary for internships a report on the work in which he participated or which he conducted independently. The report should be accepted and reviewed by the student's supervisor at the place of the internship. The student receives a credit for the completed practice.

Training duration: four weeks

Training objective: Becoming familiar with fundamental tasks and responsibilities specific to engineer’s work, especially in the field of

biomedical engineering.

Diploma exam

The scope of the diploma examination is determined by the Medical Informatics Program Committee and communicated to students by the end of the penultimate semester of study at the latest. The diploma examination is made-up of the thesis presentation, discussion of the results with the examination committee members, and diploma exam.

Study plan

Medical Informatics

Semester 1

Semester 1. The semester includes an introduction to programming, anatomy and general education subjects (mathematics, physics, and chemistry).

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Introduction to Programming	Lecture: 30 Laboratory: 45	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 3	Obligatory
Linear Algebra and Analitic Geometry	Lecture: 30 Classes: 45	Lecture: Exam Classes: Graded credit	Lecture: 3 Classes: 2	Obligatory
Mathematical Analysis 1	Lecture: 30 Classes: 45	Lecture: Exam Classes: Graded credit	Lecture: 4 Classes: 3	Obligatory
Anatomy for Biomedical Engineers	Lecture: 30	Graded credit	2	Obligatory
Physics 1	Lecture: 45 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 3 Classes: 2	Obligatory
Principles of Chemistry	Lecture: 15 Classes: 30	Lecture: Graded credit Classes: Graded credit	Lecture: 1 Classes: 2	Obligatory
Introduction to Medical Electronics	Lecture: 30	Graded credit	2	Obligatory
Sum	**405**		**29**	

Semester 2

Semester 2. The semester includes an introduction to object-oriented programming, medical science propaedeutics, medical electronics, optics and biophotonics, and a continuation of general education subjects (mathematics, physics, and chemistry).

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Mathematical Analysis 2	Lecture: 30 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 3 Classes: 3	Obligatory

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Physics 2	Lecture: 30 Classes: 15 Laboratory: 45	Lecture: Exam Classes: Graded credit Laboratory: Graded credit	Lecture: 2 Classes: 1 Laboratory: 3	Obligatory
Principles of Organic Chemistry	Lecture: 30	Graded credit	2	Obligatory
Medical Electronics 2	Lecture: 30 Classes: 15	Lecture: Graded credit Classes: Graded credit	Lecture: 2 Classes: 1	Obligatory
Introduction to Object Oriented Programming	Lecture: 30 Laboratory: 60	Lecture: Exam Laboratory: Graded credit	Lecture: 3 Laboratory: 3	Obligatory
Propaedeutics of Medical Sciences	Lecture: 30	Graded credit	2	Obligatory
Introduction to Optics and Biophotonics	Lecture: 30 Seminar: 15	Lecture: Graded credit Seminar: Graded credit	Lecture: 2 Seminar: 1	Obligatory
Bloc Humanities/Social Sciences NH1	Lecture: 30	Graded credit	3	Obligatory group
The student chooses one subject				
Introduction to Philosophy	Lecture: 30	Graded credit	3	Elective
Socjology of Organization and Leadership	Lecture: 30	Graded credit	3	Elective
Ethics	Lecture: 30	Graded credit	3	Elective
Sum	**420**		**31**	

Semester 3

Semester 3. The semester includes subjects in computer science (databases, mobile application programming, Python language, microcontrollers), physiology and medical electronics. Among the elective courses, the student chooses a language course, subjects in the social sciences and humanities, and management.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Databases	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 3 Laboratory: 3	Obligatory
Microcontrollers	Lecture: 15 Laboratory: 45	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory
Medical Electronics 2	Laboratory: 30	Graded credit	2	Obligatory

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Statistics and Probability Theory	Lecture: 30 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 3 Classes: 3	Obligatory
Mobile Application Development	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Introduction to Optics and Biophotonics	Laboratory: 15	Graded credit	1	Obligatory
Introduction to Physiology	Lecture: 15	Graded credit	1	Obligatory
Programming in Python	Laboratory: 45	Graded credit	3	Obligatory
Foreign Language 1.1	Classes: 60		3	Obligatory group
The student chooses classes from the offer of the Department of Foreign Languages				
Foreign Language 1.1	Classes: 60	Graded credit	3	Elective
Bloc Humanities/Social Sciences NH2	Lecture: 15	Graded credit	1	Obligatory group
The student chooses one subject				
Basics of Negotiations	Lecture: 15	Graded credit	1	Elective
Social Communication	Lecture: 15	Graded credit	1	Elective
Bloc Humanities/Social Sciences NS	Lecture: 15	Graded credit	1	Obligatory group
The student chooses one subject				
Entrepreneurship	Lecture: 15	Graded credit	1	Elective
Economic and Legal Environment of Enterprise	Lecture: 15	Graded credit	1	Elective
Basics of economics	Lecture: 15	Graded credit	1	Elective
Fundamentals of Marketing	Lecture: 15	Graded credit	1	Elective
Fundaments of Management	Lecture: 15	Graded credit	1	Elective
Sum	**435**		**31**	

Semester 4

Semester 4. The semester includes subjects related to the discipline of education (IT, medical apparatus, biophysics, and biochemistry). Of the elective courses, the student chooses a language course, sports activities and subjects related to the discipline of education (databases, mobile applications, bioinformatics, and time series analysis).

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Biochemistry	Lecture: 30	Exam	2	Obligatory
Biophysics	Lecture: 15 Classes: 15 Laboratory: 15	Lecture: Graded credit Classes: Graded credit Laboratory: Graded credit	Lecture: 1 Classes: 2 Laboratory: 1	Obligatory
ELectromedical Instrumentation	Lecture: 30 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Network Technologies	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 3 Laboratory: 3	Obligatory
Foreign Language 1.2	Classes: 60	Graded credit	3	Obligatory group
The student chooses classes from the offer of the Department of Foreign Languages				
Foreign Language 1.2	Classes: 60	Graded credit	3	Elective
Sport activities	Classes: 30	Graded credit	-	Obligatory group
The student chooses one subject				
Sport activities 1	Classes: 30	Graded credit	-	Elective
Bloc Optional Courses 1	Lecture: 15 Laboratory: 30 Project: 45	Graded credit	10	Obligatory group
The student chooses subjects within a block (minimum 10 ECTS)				
Databases PRO	Project: 45	Graded credit	4	Elective
Mobile Applicaton Development PRO	Project: 45	Graded credit	4	Elective
Bloc Introduction to Bioinformatics	Lecture: 15 Laboratory: 30	Graded credit	6	Elective
Introduction to Bioinformatics LEC	Lecture: 15	Graded credit	2	Obligatory in module
Introduction to Bioinformatics LAB	Laboratory: 30	Graded credit	4	Obligatory in module
Bloc Time Series Analysis	Lecture: 15 Laboratory: 30	Graded credit	6	Elective
Time Series Analysis LEC	Lecture: 15	Graded credit	2	Obligatory in module

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Time Series Analysis LAB	Laboratory: 30	Graded credit	4	Obligatory in module
Sum	**360**		**29**	

Semester 5

Semester 5. The semester includes subjects related to the discipline of education (digital signal processing, software engineering, numerical methods. and measurement systems). Of the optional courses, the student chooses sports classes and subjects related to the discipline of education (computer graphics, network technologies, nonlinear dynamics, cross-platform mobile applications).

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Digital Signal Processing	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 3	Obligatory
Software Engineering	Lecture: 30 Laboratory: 30 Project: 15	Lecture: Exam Laboratory: Graded credit Project: Graded credit	Lecture: 3 Laboratory: 3 Project: 1	Obligatory
Numerical Methods	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 3 Laboratory: 3	Obligatory
Measurement Systems	Lecture: 30	Graded credit	2	Obligatory
Sport activities	Classes: 30	Graded credit	-	Obligatory group
The student chooses one subject				
Sport activities 2	Classes: 30	Graded credit	-	Elective
Bloc Optional Courses 2	Lecture: 15 Laboratory: 45 Project: 45	Graded credit	10	Obligatory group
The student chooses subjects within a block (minimum 10 ECTS)				
Network Technologies PRO	Project: 45	Graded credit	4	Elective
Cross-Platform Mobile Application Development	Project: 45	Graded credit	4	Elective
Bloc Computer Graphics	Lecture: 15 Laboratory: 45	Graded credit	6	Elective
Computer Graphics LEC	Lecture: 15	Graded credit	2	Obligatory in module

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Computer Graphics LAB	Laboratory: 45	Graded credit	4	Obligatory in module
Bloc Elements of Nonlinear Dynamics	Lecture: 15 Laboratory: 45	Graded credit	6	Elective
Elements of Nonlinear Dynamics LEC	Lecture: 15	Graded credit	2	Obligatory in module
Elements of Nonlinear Dynamics LAB	Laboratory: 45	Graded credit	4	Obligatory in module
Sum	**360**		**30**	

Semester 6

Semester 6. The semester includes subjects related to the discipline of education (measurement systems, modeling of biological systems, medical imaging techniques, conversion and analysis of non-electrical signals), scientific writing and the first part of the diploma work. Among elective courses, the student chooses sports classes and subjects related to the discipline of education (statistical methods in bioengineering, artificial intelligence, complex systems, and virtual reality programming).

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Measurement Systems	Laboratory: 30	Graded credit	2	Obligatory
Modelling of Biological Systems	Lecture: 15 Laboratory: 30 Seminar: 30	Lecture: Exam Laboratory: Graded credit Seminar: Graded credit	Lecture: 2 Laboratory: 3 Seminar: 3	Obligatory
Conversion and Analysis of Non-Electrical Signals	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Medical Imaging Techniques	Lecture: 15 Project: 30	Lecture: Graded credit Project: Graded credit	Lecture: 1 Project: 2	Obligatory
Academic Writing	Project: 15	Graded credit	1	Obligatory
Diploma Work 1	Diploma thesis: 10	Graded credit	3	Obligatory
Bloc Optional Courses 3	Lecture: 30 Laboratory: 60	Graded credit	9	Obligatory group
The student chooses subjects within a block (minimum 9 ECTS)				
Statistical Methods in Bioengineering	Laboratory: 30	Graded credit	3	Elective
Virtual Reality Programming	Laboratory: 30	Graded credit	3	Elective

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Bloc Artificial Intelligence 1	Lecture: 30 Laboratory: 30	Graded credit	6	Elective
Artificial Intelligence 1 LEC	Lecture: 30	Graded credit	3	Obligatory in module
Artificial Intelligence 1 LAB	Laboratory: 30	Graded credit	3	Obligatory in module
Bloc Complex Systems	Lecture: 30 Laboratory: 30	Graded credit	6	Elective
Complex Systems LEC	Lecture: 30	Graded credit	3	Obligatory in module
Complex Systems LAB	Laboratory: 30	Graded credit	3	Obligatory in module
Sum	**325**		**30**	

Semester 7

Semester 7. The semester includes legal and ethical issues in biomedical engineering, a diploma seminar, practical training, and the second part of the diploma work. Among optional courses, the student chooses sports and subjects related to the discipline of study (artificial intelligence, advanced medical imaging techniques, and computer science in medicine). The program of studies ends with the submission and defense of a thesis.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Legal and Ethical Aspects in Biomedical Engineering	Seminar: 15	Graded credit	1	Obligatory
Diploma Seminar	Seminar: 30	Graded credit	2	Obligatory elective
Diploma Work 2	Diploma thesis: 30	Graded credit	12	Obligatory elective
Practical Training	-	Graded credit	6	Obligatory elective
Bloc Optional Courses 4	Lecture: 30 Laboratory: 30 Seminar: 30	Graded credit	9	Obligatory group
The student chooses subjects within a block (minimum 9 ECTS)				
Computer Science in Medicine	Seminar: 30	Graded credit	3	Elective
Current Trends in Telemedicine	Seminar: 30	Graded credit	3	Elective
Bloc Advanced Imaging Techniques	Lecture: 30 Laboratory: 30	Graded credit	6	Elective

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Advanced Imaging Techniques LEC	Lecture: 30	Graded credit	3	Obligatory in module
Advanced Imaging Techniques LAB	Laboratory: 30	Graded credit	3	Obligatory in module
Bloc Artificial Intelligence 2	Lecture: 30 Laboratory: 30	Graded credit	6	Elective
Artificial Intelligence 2 LEC	Lecture: 30	Graded credit	3	Obligatory in module
Artificial Intelligence 2 LAB	Laboratory: 30	Graded credit	3	Obligatory in module
Sum	**165**		**30**	

Syllabuses

Wrocław University of Science and Technology

Introduction to Programming

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.11TI.00241.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Information Technologies
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Graded credit • Laboratory: 45 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Acquires practical knowledge of Java programming language.	K1IBM_W10
PEU_W02	Has knowledge of basic sorting and searching algorithms.	K1IBM_W10
In terms of skills		
PEU_U01	Can efficiently use IntelliJ IDEA programming environment.	K1IBM_U04
PEU_U02	Can test and debug computer code.	K1IBM_U04
PEU_U03	Is able to design and implement simple algorithms.	K1IBM_U04

Program content ensuring learning outcomes

The course comprises lecture and laboratory. Its aim is to introduce students to the basics of programming. The scope of the course also includes acquiring a basic knowledge of data structures and algorithms.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Laboratory	45
Preparaton for classes	5
Preparation of a report/summary/presentation/paper	20
Prepararation for an exam/credit	5
Self-study of class topics	18
Credit/Exam	2
Student workload	**Hours** 125

Wrocław University of Science and Technology

Linear Algebra and Analitic Geometry

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.11PM.00242.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Subjects of basic education - mathematics
Education profile general academic profile	

Semester	**Activities, hours, ECTS and examination**
Semester 1	• Lecture: 30 h, 3 ECTS, Exam • Classes: 45 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of complex numbers and calculational methods with complex numbers.	K1IBM_W01
PEU_W02	Has knowledge of equations of selected subsets of the plane and of the space: line, plane, conical curves. Has the ability to use calculations of analytic geometry to solve geometrical problems.	K1IBM_W01
PEU_W03	Has knowledge of the theory of matrices and determinants and applications of these tools. Solves systems of linear equations. Has knowledge of linear mappings and their matrix representations.	K1IBM_W01
In terms of skills		
PEU_U01	Calculates with complex numbers.	K1IBM_U09
PEU_U02	Performs analytic geometry and vector calculus calculations.	K1IBM_U09

PEU_U03	Has the ability to calculate with matrices, to calculate determinants, to solve linear equations, to find matrix representations of linear mappings.	K1IBM_U09
In terms of social competences		
PEU_K01	Sees mathematical (algebraic) techniques as practical and theoretical tools for engineering.	K1IBM_K01

Program content ensuring learning outcomes

The Linear Algebra and Analytic Geometry course introduces fundamental concepts and computational techniques essential for various fields of mathematics, physics, and engineering. The course covers complex numbers, polynomials, analytic geometry, matrices, determinants, and systems of linear equations. Students will also explore vector spaces, linear transformations, and their matrix representations. By the end of the course, students will be able to work with algebraic structures, perform matrix operations, analyze vector spaces and their bases, solve systems of linear equations using Gaussian and Cramer’s methods, and apply analytic geometry principles in problem-solving.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	45
Preparaton for classes	40
Credit/Exam	4
Prepararation for an exam/credit	6
Student workload	**Hours** 125

Wrocław University of Science and Technology

Mathematical Analysis 1

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.11PM.00243.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - mathematics

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 4 ECTS, Exam • Classes: 45 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the basic methods of analyzing functions of one real variable.	K1IBM_W01
PEU_W02	Has knowledge of indefinite integral and methods of determining the indefinite integral.	K1IBM_W01
PEU_W03	Has knowledge of practical applications of mathematical analysis.	K1IBM_W01
In terms of skills		
PEU_U01	Analyses functions defined by means of elementary functions.	K1IBM_U09
PEU_U02	Has the ability to calculate indefinite integrals of particular functions.	K1IBM_U09
In terms of social competences		

PEU_K01	Is aware of the influence of differential and integral calculus on development of technical civilization.	K1IBM_K01

Program content ensuring learning outcomes

The Mathematical Analysis 1 course covers fundamental concepts and computational techniques related to functions, limits, derivatives, and integrals. Students will become familiar with essential tools of mathematical analysis, which are applicable in the natural and technical sciences. Upon completing the course, students will be able to: analyze the properties of functions and examine their monotonicity and extreme values, calculate limits, derivatives, and integrals of functions; apply mathematical analysis tools to solve practical problems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	45
Preparaton for classes	90
Credit/Exam	4
Prepararation for an exam/credit	6
Student workload	**Hours** 175

Wrocław University of Science and Technology

Anatomy for Biomedical Engineers

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.11PK.00244.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Defines basic concepts of Anatomy.	K1IBM_W02
PEU_W02	Has an extended knowledge of the morphology and topology of human organs.	K1IBM_W02
PEU_W03	Has ordered general knowledge, covering issues related to the structure of the human body at the cellular, tissue and organ levels.	K1IBM_W02
PEU_W04	Has knowledge of the use of biomedical engineering methods in the anatomy study and in the supporting or substituting of human organs.	K1IBM_W02
In terms of skills		

PEU_U01	Searches for information in the literature, databases, and other sources. Student can accurately interpret, select, and combine the obtained information, and can apply this information in practice. In particular, can prepare a paper on a given topic concerning the use of biomedical engineering methods in enhancing or replacing the functions of human organs	K1IBM_U06
PEU_U02	Students is able to draw conclusions, formulate and justify opinions, in particular in the field of knowledge of Anatomy.	K1IBM_U06
In terms of social competences		
PEU_K01	Is aware of the social and professional role of a technical university graduate. Can collaborate and work in a group, taking on various roles, and is ready to think and act entrepreneurially.	K1IBM_K03

Program content ensuring learning outcomes

The course aims to provide a comprehensive introduction to human anatomy with modern research methods and applications of biomedical engineering. Participants will gain an understanding of the structure and function of the human body, from the cellular level, through tissues, to entire organ systems. The course demonstrates how biomedical engineering supports diagnosis, treatment and rehabilitation, making it possible to supplement or replace bodily functions.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Preparaton for classes	8
Conducting literature research	5
Prepararation for an exam/credit	5
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Physics 1

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.11PF.00245.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Subjects of basic education - physics
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 45 h, 3 ECTS, Exam • Classes: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has well-established knowledge of Newton's dynamics principles of linear and rotational motion, methods of solving equations of motion and application of dynamics laws in physics and engineering practice.	K1IBM_W01
PEU_W02	Has well-established knowledge of the principles of conservation of mechanical energy, linear and angular momentum as well as about the conditions of their correct application in physics and engineering practice.	K1IBM_W01
PEU_W03	Has basic knowledge of properties of gravitational fields, methods of their quantitative description and motion of bodies in such fields.	K1IBM_W01
PEU_W04	Has well-established knowledge of hydrodynamics of fluids.	K1IBM_W01

PEU_W05	Has knowledge of the physical properties of vibrating and wave motion, methods of quantitative characterization of vibrations and waves and their applications in engineering activities.	K1IBM_W01
PEU_W06	Has knowledge of the basics of phenomenological thermodynamics, has knowledge of selected issues of statistical thermodynamics and methods of applying this knowledge to analysis of thermodynamic phenomena and processes.	K1IBM_W01
PEU_W07	Has a basic knowledge of properties of electrostatic fields and methods of applying this knowledge to analysis of engineering problems.	K1IBM_W01
In terms of skills		
PEU_U01	Can independently present in a written or oral form correctly and concisely issues that are the subject of learning outcomes PEU_W01-PEU_W07.	K1IBM_U06, K1IBM_U09
PEU_U02	Can qualitatively and quantitatively analyze and solve uncomplicated equations of linear and rotational motion of bodies.	K1IBM_U06, K1IBM_U09
PEU_U03	Has the ability to correctly apply the principles of conservation of mechanical energy, linear and angular momentum to analyze and solve selected physical and engineering tasks and problems.	K1IBM_U06, K1IBM_U09
PEU_U04	Is able to qualitatively and quantitatively characterize scalar and vector properties of gravitational fields and motion of bodies in these fields.	K1IBM_U06, K1IBM_U09
PEU_U05	Has the ability to analyze and solve tasks and problems related to hydrodynamics and fluids.	K1IBM_U06, K1IBM_U09
PEU_U06	Is able to qualitatively and quantitatively describe properties and effects related to vibrating motion, mechanical waves and solve tasks related to vibrations and waves.	K1IBM_U06, K1IBM_U09
PEU_U07	is able to analyze and solve tasks/problems in phenomenological and statistical thermodynamics.	K1IBM_U06, K1IBM_U09
In terms of social competences		
PEU_K01	Understands the necessity of continuous education; can make a critical assessment of the possessed knowledge and perceive the significance of knowledge in solving cognitive problems.	K1IBM_K01, K1IBM_K03
PEU_K02	Can independently determine priorities and make decisions, critically evaluate own actions taken and completed, related to e.g. studying, and accept personal responsibility for the consequences of their actions.	K1IBM_K01, K1IBM_K03, K1IBM_K04
PEU_K03	Is able to work in a group and communicate with the social environment.	K1IBM_K01, K1IBM_K03, K1IBM_K04

Program content ensuring learning outcomes

This course is the first part of Classical and Modern Physics. This part includes a lecture series and calculation exercises, which aim to provide participants with knowledge in the field of Classical Physics including Newtonian mechanics, Thermodynamics and Statistics, as well as Electrostatics.

Participants will gain skills in independently analyzing and solving selected issues related to the above mentioned fields of Classical Physics, both qualitatively and quantitatively, as well in presenting their solution strategies and gained results orally and in writing.

The acquired knowledge, skills and social competences after completing the course, will enable participants to efficiently and effectively deal with various engineering questions in the field of Classical Physics, and will additionally provide the

participants with a solid foundation for other engineering subjects.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	45
Classes	30
Self-study of class topics	20
Preparaton for classes	20
Credit/Exam	4
Prepararation for an exam/credit	6
Student workload	**Hours** 125

Wrocław University of Science and Technology

Principles of Chemistry

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.11PC.00246.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - chemistry

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 15 h, 1 ECTS, Graded credit • Classes: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has ordered, theoretically founded general knowledge about the properties of chemical compounds, molecular structure and their application in biomedical engineering.	K1IBM_W01
In terms of skills		
PEU_U01	Can understand the procedure of experiments based on physicochemical techniques. Can characterize, analyze and identify chemical compounds using measurement techniques.	K1IBM_U09
PEU_U02	Is able to perform basic chemical calculations.	K1IBM_U09
In terms of social competences		
PEU_K01	Can think and act creatively.	K1IBM_K01
PEU_K02	Is able to cooperate in a group.	K1IBM_K01

Program content ensuring learning outcomes

Obtaining basic knowledge of the laws governing chemical phenomena, the structure of matter as well as chemical bonds and states of matter. Basic knowledge of the properties of elements and chemical compounds and their molecular structure. Basic chemical calculations skills. Basic knowledge of inorganic compounds, their properties and applications.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	30
Preparaton for classes	10
Prepararation for an exam/credit	8
Self-study of class topics	10
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Introduction to Medical Electronics

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.11PK.00247.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student has the well-ordered, and well theoretically based knowledge including basic problems of electrical circuit analysis.	K1IBM_W03
In terms of skills		
PEU_U01	Is able to incorporate, combine and correctly interpret the information pieces relating to electrical phenomena.	K1IBM_U01
PEU_U02	Is able to analyse simple electrical circuits.	K1IBM_U01
In terms of social competences		
PEU_K01	Is able to retrieve information from literature, also in foreign languages.	K1IBM_K01
PEU_K02	Is able to anticipate many-sided effects of her/his decisions and activities.	K1IBM_K01

Program content ensuring learning outcomes

The subject consists of two lecture courses, classes and laboratories. The aim of the lecture course carried out this semester is to obtain elementary knowledge in the field of analysis of simple linear electrical circuits and to learn the properties of basic electronic circuit elements. Numerous examples present methods of analysis of direct current circuits, symbolic method of circuit analysis at steady state under sinusoidal excitation, and two examples of transient response of RC circuits stimulated by a rectangular signal.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Prepararation for an exam/credit	18
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Mathematical Analysis 2

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.12PM.00248.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Subjects of basic education - mathematics
Education profile general academic profile	

Semester	**Activities, hours, ECTS and examination**
Semester 2	• Lecture: 30 h, 3 ECTS, Exam • Classes: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of facts from mathematics, physics, chemistry, electrotechnology and mechanics useful in stating and solving simple problems in biomedical engineering.	K1IBM_W01
In terms of skills		
PEU_U01	Has ability to use analytic and simulational methods in biomedical engineering to state and solve engineering-type problems.	K1IBM_U09
In terms of social competences		
PEU_K01	Has ability to verify information and communicate with experts.	K1IBM_K01

Program content ensuring learning outcomes

The Mathematical Analysis 2 course is a continuation of Mathematical Analysis 1, extending its scope to functions of multiple variables and multiple integrals. Students will learn advanced computational methods applicable in physics, engineering, and other fields of the natural sciences. Upon completion, they will be able to analyze functions of multiple variables and their partial derivatives, calculate and interpret gradients and extreme values, apply multiple integrals in various coordinate systems, and utilize numerical and power series in function analysis.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	80
Prepararation for an exam/credit	6
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Physics 2

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.12PF.00249.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Subjects of basic education - physics
Education profile general academic profile	

Semester	**Activities, hours, ECTS and examination**
Semester 2	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 45 h, 3 ECTS, Graded credit • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has a well-founded knowledge of electrostatics and magnetostatics and the phenomenon of electro-magnetic induction and knows examples of applications of the laws of magnetostatics and Faraday's law in physics and engineering practice.	K1IBM_W01
PEU_W02	Has a well-founded knowledge of Maxwell's equations, the properties of electromagnetic waves and applications of this knowledge in physics and engineering practice.	K1IBM_W01
PEU_W03	Has a basic knowledge of the special theory of relativity and its applications in relativistic kinematics and dynamics.	K1IBM_W01
PEU_W04	Has knowledge related to the fundamentals of quantum physics, atomic physics, solid state physics and its selected applications in engineering activities.	K1IBM_W01

PEU_W05	Has a systematic knowledge of nuclear physics and its applications, has knowledge of particle physics and astrophysics.	K1IBM_W01
PEU_W06	Has knowledge of the: a) principles of safety and hygiene in force in the Laboratory of the Fundamentals of Physics, b) methods of performing simple and complex measurements of physical quantities, c) methods of preparing measurement results, estimating uncertainty of simple and complex measurements and principles of preparing written reports supported by utility software (text editors, graphics programs).	K1IBM_W01
In terms of skills		
PEU_U01	Can independently present in writing or orally, correctly and concisely, issues which are the content of the educational objectives PEU_W01-PEU_W05.	K1IBM_U08
PEU_U02	Can apply knowledge of magnetostatics and the phenomenon of electromagnetic induction to: a) qualitative and quantitative characterization/explanation of selected electromagnetic phenomena, b) solving standard tasks in the field defined by PEU_W01.	K1IBM_U08
PEU_U03	Can: a) explain concisely and correctly the physical sense of the system of Maxwell's equations, characterize the physical properties of electromagnetic waves, metamaterials and their applications, b) solve standard tasks in the field and use the knowledge of PEU_W02.	K1IBM_U08
PEU_U04	Has the ability to apply knowledge of contemporary physics related to the knowledge of PEU_W04 (quantum physics, atomic physics, solid state physics).	K1IBM_U08
PEU_U05	Can: a) perform simple complex measurements of physical quantities, using adequate instruments and methods, obeying the principles of work safety, b) process measurement results, perform the analysis of measurement uncertainty and prepare a report on measurements performed in the Laboratory of the Fundamentals of Physics using PEU_W06 knowledge and the appropriate application software.	K1IBM_U08
In terms of social competences		
PEU_K01	Understands the need for lifelong learning and for improving knowledge/acquisition skills and communication methods.	K1IBM_K01, K1IBM_K03, K1IBM_K04
PEU_K02	Is able to independently plan experiments and carry out measurements using application software and prepare a concise, factually correct report of the measurements made.	K1IBM_K01, K1IBM_K03, K1IBM_K04
PEU_K03	Is able to interpret the results of measurements, i.e., draw conclusions on the basis of its knowledge.	K1IBM_K01, K1IBM_K03, K1IBM_K04
PEU_K04	Can interact and work in a group.	K1IBM_K01, K1IBM_K03, K1IBM_K04

Program content ensuring learning outcomes

This course is the second part of Classical and Modern Physics. This part includes a lecture series, laboratory and calculation exercises, which aim to provide participants with knowledge in the field of Classical and Modern Physics including Newtonian mechanics, Thermodynamics and Statistics, Electrostatics and Electrodynamics, Special Theory of Relativity, as well as selected topics in Quantum Physics, Nuclear Physics, Particle Physics and Astrophysics.

Participants will gain skills in independently analyzing and solving selected issues related to the above mentioned fields of Classical Physics and Modern Physics, both qualitatively and quantitatively, as well in presenting their solution strategies and gained results orally and in writing. Furthermore, participants will gain skills in performing, analyzing and reporting

measurements of physical quantities using adequate instruments and methods.

The acquired knowledge, skills and social competences after completing the course, will enable participants to efficiently and effectively deal with various engineering questions in the field of Classical Physics and Modern Physics, and will additionally provide the participants with a solid foundation for other engineering subjects.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	45
Classes	15
Self-study of class topics	10
Preparation of a report/summary/presentation/paper	30
Preparaton for classes	10
Credit/Exam	4
Prepararation for an exam/credit	6
Student workload	**Hours** 150

Wrocław University of Science and Technology

Principles of Organic Chemistry

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.12PC.00250.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - chemistry

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has a basic knowledge of organic chemistry, about the structure of organic compounds, their properties, applications and functions in the body	K1IBM_W01

Program content ensuring learning outcomes

Basic knowledge of organic chemistry. Basic knowledge of organic compounds, their properties, applications and functions in the body. Identification of chemical compounds

Calculation of ECTS points

Activity form	Activity hours

Lecture	30
Preparaton for classes	10
Prepararation for an exam/credit	8
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Medical Electronics 2

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.12PK.00251.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has the well-ordered, and well theoretically based knowledge including the structure, action, and properties of basic analog and digital electronic components and circuits	K1IBM_W03, K1IBM_W04, K1IBM_W09
In terms of skills		
PEU_U01	Has knowledge of the fundamental methods of electrical circuits' analysis and is able to use them in practice in understanding the action of simple electronic circuits.	K1IBM_U09
PEU_U02	Is able to plan and practically perform simple experiments in which properties of electrical circuits are investigated and is able both to elaborate and to understand the results.	K1IBM_U09
In terms of social competences		

PEU_K01	Is able to retrieve information from literature, also in foreign languages	K1IBM_K02
PEU_K02	Is able to anticipate many-sided effects of her/his decisions and activities	K1IBM_K02

Program content ensuring learning outcomes

This is the second part of the lecture devoted to electronic circuits and the basic methods of their analysis. Students will now learn about the construction, action and properties of basic electronic components such as diodes, transistors, optoelectronic components, operational amplifiers, and comparators. They will also be familiarized with the basic properties of amplification systems and the use of operational amplifiers to build various analog circuits. Then, students will learn about the properties of digital circuits and their basic types. After these courses, students not only have practical skills within the scope of analysis of simple linear electrical circuits, but also know how to measure basic electrical quantities. They know how the uncertainty of measurement result should be determined both in a direct and in a combined measurement.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	15
Prepararation for an exam/credit	10
Preparaton for classes	18
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Introduction to Object Oriented Programming

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.12PK.00252.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Exam • Laboratory: 60 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the object-oriented programming paradigm.	K1IBM_W10
In terms of skills		
PEU_U01	Can define class hierarchies.	K1IBM_U04
PEU_U02	Can perform unit tests.	K1IBM_U04
PEU_U03	Can develop JavaFX desktop applications.	K1IBM_U04

Program content ensuring learning outcomes

The course comprises lecture and laboratory. Its aim is to introduce students to the fundamentals of object-oriented programming.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Laboratory	60
Preparation of a report/summary/presentation/paper	25
Prepararation for an exam/credit	6
Self-study of class topics	25
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Propaedeutics of Medical Sciences

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.12PK.00253.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the basic concepts of propaedeutics of medical sciences.	K1IBM_W02
PEU_W02	Has advanced knowledge of diseases and organ pathologies.	K1IBM_W02
PEU_W03	Has well-organized foundational knowledge on topics related to the structure of the human body at the cellular, tissue, and organ levels.	K1IBM_W02
PEU_W04	Has a solid knowledge of the application of biomedical engineering methods in therapy, diagnostics, and healthcare.	K1IBM_W02
In terms of social competences		
PEU_K01	Can collaborate and function within a group, taking on various roles, and is prepared to think and act entrepreneurially.	K1IBM_K03

PEU_K02	Is aware of the social and professional role of a technical university student, particularly regarding the reliable and honest transfer of information and the fair process of acquiring knowledge.	K1IBM_K03

Program content ensuring learning outcomes

The course aims at acquiring participants' knowledge of basic conceptual categories related to the propaedeutics of medical science. Participants will acquire basic knowledge of the pathology of organs and systems of the human body, epidemiology, diseases of civilisation, infectious diseases, immunology, transplantology, cancer. They will also acquire knowledge on the practical application of biomedical engineering methods in therapy, diagnosis and healthcare.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Preparaton for classes	5
Conducting literature research	5
Prepararation for an exam/credit	3
Preparation of a report/summary/presentation/paper	5
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Introduction to Optics and Biophotonics

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.16PK.00254.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Semester	Activities, hours, ECTS and examination
Semester 3	• Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has theoretical general knowledge of Biophotonics fundamentals, including optical parameters of tissues, interaction of light with tissues, optical diagnostics techniques and light based therapeutics approaches.	K1IBM_W03
PEU_W02	Has ordered general knowledge of the basics of Optics, knows optical elements, basic instrumentation and rules of working with optical radiation.	K1IBM_W03
In terms of skills		
PEU_U01	Is able to use the acquired knowledge to formulate and solve complex problems in Biophotonics and Optics.	K1IBM_U06, K1IBM_U08, K1IBM_U10

PEU_U02	Can perform laboratory tasks through selection and application of proper methods and tools.	K1IBM_U08, K1IBM_U10
PEU_U03	Can plan and carry out experiments including measurements and computer simulations, interpret the obtained results and draw conclusions in the field of Optics and Biophotonics.	K1IBM_U08, K1IBM_U10
PEU_U04	Can take part in a debate and present, and evaluate various opinions and positions related to Biophotonics and Optics issues.	K1IBM_U06, K1IBM_U10
PEU_U05	Can plan and organize work individually and in a team.	K1IBM_U06, K1IBM_U10

Program content ensuring learning outcomes

This course introduces participants to advanced topics in optics and its applications in biology, medicine, and biomedical engineering. It covers optical parameters of tissues, absorption laws, and luminescence, focusing on their use in diagnostics and therapy. Key topics include the interaction of electromagnetic radiation with tissues, the role of wave optics in medicine, and cutting-edge techniques such as optical microscopy, spectroscopy, and interstitial laser thermal therapy. The course also explores practical aspects like studying the physical properties of photovoltaic cells and the light-attenuating characteristics of materials used in protective eyewear.

Calculation of ECTS points

Semester 2

Activity form	**Activity hours**
Lecture	30
Seminar	15
Preparaton for classes	10
Conducting literature research	10
Prepararation for an exam/credit	8
Credit/Exam	2
Student workload	**Hours** 75

Semester 3

Activity form	**Activity hours**
Laboratory	15
Preparation of a report/summary/presentation/paper	7
Preparaton for classes	3

Student workload	Hours 25

Wrocław University of Science and Technology

Introduction to Philosophy

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.12HS.02375.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Subjects from the fields of humanities or social sciences
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the non-technical aspects and determinants of various professional activities.	K1IBM_W05
In terms of social competences		
PEU_K01	Is able to critically evaluate received information, assess the credibility of sources, formulate independent opinions, and effectively defend them.	K1IBM_K04

Program content ensuring learning outcomes

This course introduces students to key philosophical issues, focusing on those that offer insights into the fundamental challenges of the contemporary world. It begins by exploring the unique nature of philosophy as a form of human knowledge about the world. The course then addresses core topics in ethics, social philosophy, epistemology, metaphysics, argumentation theory, and the philosophy of science and technology. The course design and topic selection aim to foster

students' critical thinking skills while enhancing their awareness of the social responsibility inherent in science and technology.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	20
Preparaton for classes	10
Prepararation for an exam/credit	13
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Socjology of Organization and Leadership

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.12HS.04470.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the basic principles of creation and development of various forms of entrepreneurship.	K1IBM_W05
PEU_W02	Has knowledge of the fundamental dilemmas of modern civilization.	K1IBM_W05
In terms of social competences		
PEU_K01	Is ready to critically evaluate the knowledge that they have learned and perceived content.	K1IBM_K04
PEU_K02	Is ready to fulfil one’s social obligations, and co-organize activities on behalf of society.	K1IBM_K04

Program content ensuring learning outcomes

This course examines the relationship between sociology and organizational structures, focusing on social group dynamics, power relations, and modern management practices. Topics include classical and contemporary organizational theories, Management 3.0, motivation, influence, decision-making, and leadership styles. Participants will gain insights and practical tools to navigate and lead in today’s complex organizational environments.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Preparation of a report/summary/presentation/paper	20
Self-study of class topics	23
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Ethics

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.12HS.04471.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student identifies, distinguishes between ethical, humanistic and social determinants of contemporary organisations. Has knowledge of the key dilemmas of modern civilisation.	K1IBM_W05
In terms of social competences		
PEU_K01	The student expresses critical judgements about the impact of professional work on the social environment. Demonstrates initiative to act in the public interest and to fulfil social obligations, inspire and organise activities for the benefit of the social environment.	K1IBM_K04

Program content ensuring learning outcomes

The course includes a lecture aimed at giving participants the tools to understand and analyse the non-technical aspects of an engineer's activity. In particular, acecnt is placed on understanding the ethical dimension, as well as the broader cultural

context and understanding the fundamental challenges of modern civilisation, in their complexity and deepest layers, with a particular focus on the development of contemporary technologies, especially digital information reproduction techniques. With the knowledge acquired, participants will be able to develop the ability to critically analyse the activities of an engineer in a contemporary social context and identify moral dilemmas.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	30
Preparaton for classes	15
Student workload	**Hours** 75

Wrocław University of Science and Technology

Databases

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.14PK.00257.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 30 h, 3 ECTS, Exam • Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of basic database terminology.	K1IBM_W10
PEU_W02	Has knowledge of SQL syntax and SQL query writing.	K1IBM_W10
PEU_W03	Acquires knowledge of database project preparation.	K1IBM_W10
PEU_W04	Acquires knowledge of data modelling.	K1IBM_W10
In terms of skills		
PEU_U01	Is able to employ SQL to retrieve, search, update data and to create database objects.	K1IBM_U04
PEU_U02	Is able to implement functions, stored procedures and trigger using SQL.	K1IBM_U04

PEU_U03	Is able to make use of data modelling software and to develop simple database application.	K1IBM_U12
PEU_U04	Is able to model data, design and normalize database schemes.	K1IBM_U04, K1IBM_U12
PEU_U05	Is able to implement database application.	K1IBM_U04, K1IBM_U07, K1IBM_U12

Program content ensuring learning outcomes

The course comprises lecture and laboratory classes. Its aim is to familiarize students with the basics of database systems and gain basic knowledge of database programming and administration. Participants will acquire knowledge and skills in data modeling and database documentation. This will allow them to design database systems, with a special focus on medical systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	38
Prepararation for an exam/credit	8
Self-study of class topics	30
Credit/Exam	4

Student workload	**Hours** 150

Wrocław University of Science and Technology

Microcontrollers

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14PK.00258.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 45 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has basic knowledge of the structure of a typical microcontroller and of its peripheral elements and also of its programming in both an assembler and C languages.	K1IBM_W03
PEU_W02	Knows basic rules of preparing a proper documentation of a program.	K1IBM_W03
In terms of skills		
PEU_U01	Is able to analyse, write and practically debug simple programs using typical algorithms and data structures.	K1IBM_U05
PEU_U02	Is able to divide a complex programming task into parts and practically build a structured multilevel program	K1IBM_U05
PEU_U03	Is able to use basic tool programs such as: editor, assembler, debugger or simulator.	K1IBM_U05

In terms of social competences		
PEU_K01	Is able to retrieve information from literature, also in foreign languages.	K1IBM_K01
PEU_K02	Is able to anticipate many-sided effects of her/his decisions and activities.	K1IBM_K02

Program content ensuring learning outcomes

This course of study includes a lecture course and laboratory classes. During these courses, students acquire basic knowledge about the resources of typical microcontroller and about possibilities of their practical application. They also possess basic practical skills in programming with an assembler language and develop their skills at programming techniques in C language. By this students acquire practical skills in using of an exemplary development environment for preparing and debugging their own programs.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	45
Prepararation for an exam/credit	5
Preparation of a project	8
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Medical Electronics 2

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14PK.00259.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has the well-ordered, and well theoretically based knowledge including the structure, action, and properties of basic analog and digital electronic components and circuits	K1IBM_W09
In terms of skills		
PEU_U01	Has knowledge of the fundamental methods of electrical circuits' analysis and is able to use them in practice in understanding the action of simple electronic circuits.	K1IBM_U09
PEU_U02	Is able to plan and practically perform simple experiments in which properties of electrical circuits are investigated and is able both to elaborate and to understand the results.	K1IBM_U09
In terms of social competences		
PEU_K01	Is able to retrieve information from literature, also in foreign languages	K1IBM_K02

PEU_K02	Is able to anticipate many-sided effects of her/his decisions and activities	K1IBM_K02

Program content ensuring learning outcomes

After completing lecture courses and classes in previous semesters, this semester students perform experiments in the laboratory. Upon completion of the laboratory, students should:

- be acquainted with the structure, the action, and properties of basic electronic components and circuits;
- have practical skills within the scope of analysis of simple linear electrical circuits
- know how basic electric quantities may be measured
- know how the uncertainty of measurement result should be determined both in a direct and in a combined measurement.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	30
Preparation of a report/summary/presentation/paper	15
Preparaton for classes	5
Student workload	**Hours** 50

Wrocław University of Science and Technology

Statistics and Probability Theory

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.14PM.00260.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - mathematics

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 30 h, 3 ECTS, Exam • Classes: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the theories, facts, and methods of mathematics, physics, chemistry, electrical engineering, and electronics useful for formulating and solving simple tasks in biomedical engineering.	K1IBM_W01
PEU_W02	Has knowledge of the theories, facts, and methods of mathematics, physics, chemistry, electrical engineering, and electronics useful for formulating and solving simple tasks in biomedical engineering.	K1IBM_W01
In terms of skills		
PEU_U01	Ability to use analytical, simulation, and experimental methods to formulate and solve engineering tasks within the discipline of biomedical engineering.	K1IBM_U09
PEU_U02	Ability to solve in an innovative way non-standard problems of Biomedical Engineering in unpredictable conditions.	K1IBM_U01

PEU_U03	Ability to communicate using specialized terminology of biomedical engeeniring and explain one's opinion.	K1IBM_U05
In terms of social competences		
PEU_K01	Potrafi krytycznie ocenić własną wiedzę oraz zasięgać opinii ekspertów w przypadku trudności z samodzielnym rozwiązaniem problemu. Ability to critically assess one's own knowledge and possibility to obtain advice from other experts.	K1IBM_K01

Program content ensuring learning outcomes

The course covers fundamental topics in measure theory and probability, forming the basis of modern mathematical statistics. Lectures and exercises explore metric spaces, sigma-algebras, and probability measures. Special attention is given to random variables, their expected value, variance, and various probability distributions (including Bernoulli, Gaussian, and Poisson distributions). The course also introduces the theory of convergence of sequences of random variables, the central limit theorem, and the law of large numbers. In the final part, hypothesis testing methods and parameter estimation are discussed. The course combines theory with practical applications, preparing participants for data analysis and probabilistic modeling.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	80
Credit/Exam	4
Prepararation for an exam/credit	6
Student workload	**Hours** 150

Wrocław University of Science and Technology

Mobile Application Development

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14PK.00261.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 30 h, 2 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the principles of object-oriented programming in Kotlin.	K1IBM_W08, K1IBM_W10
PEU_W02	Has knowledge of the anatomy of Android applications.	K1IBM_W10
PEU_W03	Has knowledge of the Android application and activity life cycle.	K1IBM_W10
In terms of skills		
PEU_U01	Can find the software, technical documentation, and information necessary to complete the development tasks related to mobile platforms	K1IBM_U04, K1IBM_U07
PEU_U02	Can implement mobile apps which make use of Internet communication protocols, relational and non-relational databases	K1IBM_U04, K1IBM_U12

PEU_U03	Can implement Mobile Health Android apps	K1IBM_U04, K1IBM_U07, K1IBM_U12

Program content ensuring learning outcomes

The course includes lectures and laboratories designed to provide participants with both theoretical knowledge and practical skills in programming mobile applications for Android. During the course, participants will learn how to design user interfaces, program basic functionalities of mobile applications, and work with databases. The acquired knowledge and skills will allow participants to create mobile applications, with a particular focus on mHealth solutions.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	5
Preparation of a report/summary/presentation/paper	30
Prepararation for an exam/credit	3
Credit/Exam	2
Student workload	**Hours** 100

Wrocław University of Science and Technology

Introduction to Physiology

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.14PK.00262.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of selected facts, objects, and phenomena as well as methods and theories related to them, which constitute advanced general knowledge in the field of study programs related to Biomedical Engineering.	K1IBM_W02
In terms of social competences		
PEU_K01	Is ready to create and develop patterns of proper conduct in work and living environment.	K1IBM_K05
PEU_K02	Is ready to lead the group and take responsibility for it.	K1IBM_K05
PEU_K03	Is ready to fulfill social obligations, inspire and organizing activities for the benefit of the social environment.	K1IBM_K01, K1IBM_K05

Program content ensuring learning outcomes

The course covers an introduction to human physiology and the functioning of the human body, focusing on basic concepts and general human characteristics. Participants will learn about the mechanisms of homeostasis that maintain the body's internal balance, and the physiology of the main systems: locomotor, nervous, cardiovascular, lymphatic, excretory, digestive and respiratory. The course also provides an understanding of the functioning of the endocrine system and fluid economy, key to the body's normal function. The class is tailored to those interested in the physiology and functioning of the human body. Participation will enable participants to acquire a basic knowledge of human body functions and their regulation at the molecular, cellular, tissue and whole-body levels, as well as acquiring knowledge of physiological research methodology of organs and systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Credit/Exam	2
Preparaton for classes	8
Student workload	**Hours** 25

Wrocław University of Science and Technology

Programming in Python

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14PK.00263.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Laboratory: 45 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Can write programs in Python, up to intermediate level of complexity, with emphasis on solving tasks relevant to Medical Informatics.	K1IBM_U04

Program content ensuring learning outcomes

The laboratory course aims to develop programming skills in Python. Completion of the course will enable participants to gain a basic understanding of the Python programming language ecosystem and its features relevant to medical informatics, as well as to acquire basic practical programming skills in Python with a focus on techniques relevant to medical informatics.

Calculation of ECTS points

Activity form	Activity hours

Laboratory	45
Preparaton for classes	8
Self-study of class topics	8
Prepararation for an exam/credit	6
Preparation of a report/summary/presentation/paper	8
Student workload	**Hours** 75

Wrocław University of Science and Technology

Foreign Language 1.1

Educational subject description sheet

Basic information

Field of study lektoraty	**Education cycle** 2025/2026
Speciality -	**Subject code** PWRSJOS.86JO.01761.25
Organizational unit Wrocław University of Science and Technology	**Lecture languages** English
Study level first degree	**Mandatoriness** Elective
Study form full-time studies	**Block** Foreign languages
Education profile general academic profile	

Semesters	**Activities, hours, ECTS and examination**
Semester 2, Semester 3	• Classes: 60 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student has knowledge, skills and competences specified for the appropriate language level: knows and uses linguistic resources (grammatical, lexical) and those from the academic environment specified at the level; uses general and selective reading and comprehension skills; creates written forms of expression; communicates in family, social, academic and professional environments; develops social competences by working in a group and recognizing the intercultural context.	SJO_S1_U01

Program content ensuring learning outcomes

Classes, topic and grammar related content.

Calculation of ECTS points

Activity form	Activity hours
Classes	60
Preparaton for classes	30
Student workload	**Hours** 90

Wrocław University of Science and Technology

Basics of Negotiations

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.14HS.04476.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student defines key concepts in negotiation theory.	K1IBM_W05
PEU_W02	The student has knowledge useful for formulating and solving tasks in the field of dispute resolution methods.	K1IBM_W05
PEU_W03	The student understands the regularities of social, organisational, interpersonal behaviour and their determinants.	K1IBM_W05
PEU_W04	The student knows the basic means and systems of communication in various social structures and the characteristics of an efficient communication process.	K1IBM_W05
In terms of social competences		
PEU_K01	The student is able to identify, analyse and solve professional and social problems in the workplace. The student is able to flexibly look for ways to solve them.	K1IBM_K04

Program content ensuring learning outcomes

The course includes a lecture, the aim of which is to familiarise students with the knowledge and terminology of negotiation theory. During the lecture, the student is introduced to the course of the negotiation process, learns ways and tools for solving disputes, negotiation techniques, as well as ways of social influence, manipulation techniques and defence against manipulation in negotiations. The student learns ways of communication in crisis and conflict. The aim of the lecture is also to develop in students the ability to argue and defend their own position.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Prepararation for an exam/credit	8
Credit/Exam	2
Student workload	**Hours** 25

Wrocław University of Science and Technology

Social Communication

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14HS.03535.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Subjects from the fields of humanities or social sciences
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the basic economic, legal, ethic and other conditions of undertaking various types of activities relating to the awarded qualification, including basic concepts and regulations on industrial property rights and copyrights.	K1IBM_W05
In terms of social competences		
PEU_K01	Is ready to initiate activities on behalf of the public interest	K1IBM_K04

Program content ensuring learning outcomes

The aim of the course is to familiarise students with the basic knowledge relating to social communication and to acquire the skills to observe, analyse and participate in social life in terms of communication. In particular, students will become familiar with the variety of ways, forms and types of social communication: direct and indirect, verbal and non-verbal, informational and persuasive. The course will also familiarise them with organisational, political and mass communication.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Prepararation for an exam/credit	8
Credit/Exam	2
Student workload	**Hours** 25

Wrocław University of Science and Technology

Entrepreneurship

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14HS.01942.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Subjects from the fields of humanities or social sciences
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student define the knowledge of economic, social and legal factors related to the development of individual and organizational entrepreneurship in the area of engineering activities in the field of biomedical engineering	K1IBM_W05
In terms of social competences		
PEU_K01	Is oriented towards thinking and acting in a creative, innovative, and entrepreneurial manner in the area of engineering activities in the field of biomedical engineering.	K1IBM_K04

Program content ensuring learning outcomes

The program content includes knowledge in the field of entrepreneurship, in particular knowledge about the development and use of entrepreneurial skills to create innovative ventures. It allows students to gain knowledge about strategies, models, and methods as instruments for building an enterprise focused on the development of innovation.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Conducting literature research	10
Student workload	**Hours** 25

Wrocław University of Science and Technology

Economic and Legal Environment of Enterprise

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14HS.04473.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Subjects from the fields of humanities or social sciences
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Defines key terms related to conducting business. Characterizes and classifies the legal forms of doing business and the procedure for establishing a sole proprietorship run by an natural person.	K1IBM_W05
PEU_W02	Identifies and explains the micro- and macroeconomic conditions of conducting business	K1IBM_W05
In terms of social competences		
PEU_K01	He is ready to think and act creatively and entrepreneurially, and to initiate action for the public interest.	K1IBM_K04

Program content ensuring learning outcomes

The course includes a lecture designed to teach students about the forms of business, the economic and legal conditions of conducting business, and sources of raising capital in various phases of the organization's life cycle. Regulations e.g. on the

tax system and hiring of employees, socio-economic trends as well as methods of analyzing the enterprise environment will be discussed.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Prepararation for an exam/credit	10
Student workload	**Hours** 25

Wrocław University of Science and Technology

Basics of economics

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.14HS.04474.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Can identify main factors affecting economic activity on micro and macro level	K1IBM_W05
In terms of social competences		
PEU_K01	Can engage in a discussion and defend his/her views regarding economy.	K1IBM_K04

Program content ensuring learning outcomes

This course covers key economic concepts, including the basics of economics, demand and supply, welfare and behavioral economics, market structures, and macroeconomic indicators. It provides a balanced mix of theory and practical insights into how economies function. The student will acquire knowledge covering the main factors influencing business activity on a micro and macro scale.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Preparation of a report/summary/presentation/paper	4
Self-study of class topics	4
Credit/Exam	2
Student workload	**Hours** 25

Wrocław University of Science and Technology

Fundamentals of Marketing

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.14HS.04475.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Subjects from the fields of humanities or social sciences
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Defines basic marketing concepts and explains their significance in business operations, distinguishes the elements of the marketing mix, and explains their impact on the consumer decision-making process.	K1IBM_W05
In terms of social competences		
PEU_K01	Is ready to evaluate the importance of marketing knowledge in solving practical market problems and implementing technological innovations.	K1IBM_K04

Program content ensuring learning outcomes

The aim of the course is to provide fundamental knowledge (including application aspects) about: marketing concept, different orientations towards marketing activities and the nature and basic problems of marketing, key elements of marketing activities.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Preparation of a project	5
Prepararation for an exam/credit	5
Student workload	**Hours** 25

Wrocław University of Science and Technology

Fundaments of Management

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.14HS.04477.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Introduces and explains concepts in entrepreneurship, the nature and type of entrepreneurial activity, and the characteristics of an entrepreneur	K1IBM_W05
PEU_W02	Presents knowledge of the essence and functions of management, analyzes selected problems of business management	K1IBM_W05
PEU_W03	Explains the organization's relationship with the environment and its impact on entrepreneurship	K1IBM_W05
In terms of social competences		
PEU_K01	Demonstrates individual and team activity beyond engineering activities, assuming various roles in the group	K1IBM_K04
PEU_K02	Demonstrates initiative in prioritizing tasks and the need to organize work to achieve the goals set	K1IBM_K04

Program content ensuring learning outcomes

The course includes a lecture, which is designed to provide participants with knowledge and the acquisition of social competencies on the basic concepts of business management and the organization of group work, while solving a case study. The knowledge of identifying and analyzing selected problems occurring in the field of business management will be used to solve case studies in groups and individually. The acquired social competencies will allow participants to better understand social situations.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Credit/Exam	3
Prepararation for an exam/credit	4
Preparaton for classes	3
Student workload	**Hours** 25

Wrocław University of Science and Technology

Biochemistry

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.18PK.00270.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Lecture: 30 h, 2 ECTS, Exam

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student describes the basic structural elements of proteins and their levels of structural organization, explains the principles of peptide chain folding, and presents fundamental knowledge of protein isolation and purification techniques	K1IBM_W01, K1IBM_W03
PEU_W02	Student presents fundamental information on enzyme kinetics, describes methods of regulating enzyme activity, and explains the mechanisms of enzymatic catalysis	K1IBM_W01, K1IBM_W03
PEU_W03	Student describes the structure of DNA and RNA, explains the flow of genetic information, and outlines the process of protein biosynthesis	K1IBM_W01, K1IBM_W03
PEU_W04	Student explains the basic principles of drug design	K1IBM_W01, K1IBM_W03
PEU_W05	Student explains the basic metabolic pathways	K1IBM_W01, K1IBM_W03

Program content ensuring learning outcomes

The course covers key aspects of biochemistry, particularly the relationships between the structure and function of biomolecules. Students gain knowledge about the structure and function of proteins, regulatory and catalytic strategies of enzymes, as well as the mechanisms governing biological signaling pathways. They will also be introduced to the structure of nucleic acids and the principles of genetic information transfer, including the mechanisms of replication, transcription, and translation. The course introduces essential methods in molecular biology, such as PCR, gene cloning, and DNA sequence analysis. Fundamental topics related to molecular movement mechanisms and the function of sensory systems at the cellular level are also discussed. Participants will learn the basic principles of drug design, including strategies for identifying molecular targets and optimizing active compounds.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Prepararation for an exam/credit	12
Preparaton for classes	2
Self-study of class topics	2
Credit/Exam	4
Student workload	**Hours** 50

Wrocław University of Science and Technology

Biophysics

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.18PK.00271.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	

Semester	**Activities, hours, ECTS and examination**
Semester 4	• Lecture: 15 h, 1 ECTS, Graded credit • Classes: 15 h, 2 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has structured, theoretically based general knowledge covering key issues in the field of biomedical engineering, in particular in the field of biophysics.	K1IBM_W03
In terms of skills		
PEU_U01	Acquiring interdisciplinary thinking skills.	K1IBM_U08, K1IBM_U09
PEU_U02	Able to plan and carry out experiments, esp in the field of biomedical engineering, as well as analyze the obtained results and draw conclusions. Uses analytical methods and experimental to formulate and solve engineering tasks in this field.	K1IBM_U08, K1IBM_U09
In terms of social competences		

PEU_K01	The student is able to present and explain socially important issues in the field of biomedical engineering	K1IBM_K01, K1IBM_K03
PEU_K02	Is able to interact and cooperate in a group, taking on various roles in it, and is ready to think and act in an entrepreneurial way.	K1IBM_K01, K1IBM_K03

Program content ensuring learning outcomes

The course aims to introduce theoretical foundations for further study of issues related to quantitative physiology, biosensors, biospectroscopy and modeling of biophysical phenomena. This is a compulsory subject for first-cycle students of full-time studies.
The course program covers issues related to the basics of the structure of matter, chemical bonds and intermolecular interactions in the context of biological systems, as well as processes such as diffusion, osmosis and transport through biological membranes. Great emphasis is placed on the biophysics of cell membranes, including ion channels and nerve cell membranes.
Classes have various forms: lectures, exercises and laboratories. The lectures cover, among others: basics of thermodynamics and mechanisms of transport through biological membranes. The exercises focus on tasks related to liquid flow, similarity analysis and thermodynamics, while the laboratories include practical research on, among others, dialysis and radioactivity.
After completing the course, students will have a solid theoretical and practical foundation that will enable them to further explore complex biophysical phenomena and apply the acquired knowledge in the field of biomedical engineering.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	15
Laboratory	15
Preparaton for classes	28
Prepararation for an exam/credit	15
Preparation of a report/summary/presentation/paper	10
Credit/Exam	2
Student workload	**Hours** 100

Wrocław University of Science and Technology

ELectromedical Instrumentation

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.18PK.00272.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Lecture: 30 h, 2 ECTS, Graded credit • Laboratory: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has the basic knowledge of the construction and properties of the electrical medical devices for diagnostics and therapy. Indicates the conditions of use of the electrical medical devices and their diagnostic and therapeutic capabilities.	K1IBM_W03, K1IBM_W04
In terms of skills		
PEU_U01	Is able to use the basic electromedical diagnostic and therapeutic devices. Is able to ensure the proper condition for working of these devices. Is able to assess the technical and functional properties of these devices.	K1IBM_U07
In terms of social competences		
PEU_K01	Is aware of the limitations of his own knowledge and understands the need for further education. Is able to formulate questions to deepen his own understanding subject.	K1IBM_K01

Program content ensuring learning outcomes

The course includes a lecture and laboratory classes, which aim are to provide participants with knowledge and practical skills in the field of construction, operating principles, conditions of use and properties of electromedical devices for diagnostics and therapy. Thanks to the acquired knowledge and practice, participants will be able to correctly operate basic electromedical devices and assess their technical and functional properties.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	15
Preparaton for classes	15
Preparation of a report/summary/presentation/paper	38
Credit/Exam	2
Student workload	**Hours** 100

Wrocław University of Science and Technology

Network Technologies

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.18PK.00273.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Lecture: 30 h, 3 ECTS, Exam • Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of computer network architecture.	K1IBM_W10
PEU_W02	Has knowledge of communication protocols and network services.	K1IBM_W10
PEU_W03	Acquires knowledge of computer network security.	K1IBM_W10
PEU_W04	Has knowledge of web design principles.	K1IBM_W10
In terms of skills		
PEU_U01	Is able to monitor network devices and computer networks.	K1IBM_U04
PEU_U02	Is able to manage web services.	K1IBM_U04
PEU_U03	Is able to implement web application in client-server model.	K1IBM_U04, K1IBM_U07, K1IBM_U12

Program content ensuring learning outcomes

The course comprises lecture and laboratory classes. Its purpose is to familiarize students with the basics of LAN and WAN, Internet architecture and communication protocols. Participants will acquire the knowledge and skills to develop Internet applications using various communication protocols.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	40
Prepararation for an exam/credit	8
Self-study of class topics	28
Credit/Exam	4
Student workload	**Hours** 150

Foreign Language 1.2

Educational subject description sheet

Basic information

Field of study lektoraty	**Education cycle** 2025/2026
Speciality -	**Subject code** PWRSJOS.8CJO.01766.25
Organizational unit Wrocław University of Science and Technology	**Lecture languages** English
Study level first degree	**Mandatoriness** Elective
Study form full-time studies	**Block** Foreign languages
Education profile general academic profile	

Semesters	**Activities, hours, ECTS and examination**
Semester 3, Semester 4	• Classes: 60 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Student has knowledge, skills and competences consistent with the requirements specified for the CEFR level B2 minimum; knows, understands and uses linguistic means (grammatical, lexical and stylistic) typical of academic, specialist and technical languages used in the field of study and used in the academic and professional environment; communicates effectively in interdisciplinary teams, practicing communication, creativity and critical thinking skills; appreciates the need to improve their skills in the field of specialized languages.	SJO_S1_U01

Program content ensuring learning outcomes

B2.2 English, French, Spanish, German
C1.2 English, German
General educational content

Self-presentation and team building, e.g. student's own profile in the context of a technical university and interests in the field of science; effectively presenting yourself, your interests and ideas in academic and professional contexts, interactive team-building tasks.
Presentation on a topic related to the field of study and students' scientific interests - presentation structure, development and discussion of visual materials - charts, tables, illustrations; using characteristic phrases and expressions, presenting a presentation and conducting a discussion related to the presentation.
Preparation for individual and project work with selected issues in a specialized language related to the field being studied - materials selected by students and the instructor.
Language in communication on academic topics using specialized language - e.g. formulating and exchanging views supported by arguments, joining the discussion, paraphrasing the presented content, moving on to subsequent points, summarizing statements, using characteristic phrases and expressions; taking part in various forms of interaction, using various discourse strategies.

Calculation of ECTS points

Activity form	**Activity hours**
Classes	60
Preparaton for classes	30
Student workload	**Hours** 90

Wrocław University of Science and Technology

Sport activities 1

Educational subject description sheet

Basic information

Field of study
wychowanie fizyczne

Speciality
-

Organizational unit
Wrocław University of Science and Technology

Study level
first degree

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
PWRSWFS.8EWF.04468.25

Lecture languages
English

Mandatoriness
Elective

Block
Physical education classes

Semesters	Activities, hours, ECTS and examination
Semester 2, Semester 3, Semester 4	• Classes: 30 h, 0 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The participant knows how to organize health-promoting training according to his or her interests, using the principles of a selected sports discipline or form of recreation.	SWF_S1_U01
PEU_U02	The student knows training methods that develop motor skills using their own body weight and various equipment.	SWF_S1_U01
PEU_U03	The student knows the basic technique of shaping exercises needed to prepare the body for physical exercise.	SWF_S1_U01
PEU_U04	The student knows the basic rules of safe behavior during physical activity.	SWF_S1_U01
PEU_U05	The student is able to develop a short- and long-term training plan adequate to his or her abilities.	SWF_S1_U01

PEU_U06	The student knows the principles of strengthening the deep and peripheral stabilization apparatus and the technique of basic exercises shaping aerobic and strength capacity.	SWF_S1_U01

Program content ensuring learning outcomes

Sports activities – ABT, aikido, badminton, bodyART, body ball, Brazilian Jiu Jitsu, Callanetics, cuban salsa fit, futsal, yoga, jogging, judo, karate, basketball, bodybuilding, athletics, body shaping, skiing, Nordic walking, pilates, football, handball, volleyball, swimming, pump, rugby, self-defense, shape, squash, stretch-one, ballroom dancing, table tennis, tennis, functional training, health-promoting training, mountain hiking, cycling tourism, floorball, rowing, climbing, corrective classes, Zumba, corrective classes for students with disabilities.

Calculation of ECTS points

Activity form	**Activity hours**
Classes	30
Student workload	**Hours** 30

Wrocław University of Science and Technology

Databases PRO

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.18PK.00279.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Project: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Is able to implement database application.	K1IBM_U04, K1IBM_U12

Program content ensuring learning outcomes

The course comprises projects aimed at the practical application of the skills and knowledge acquired during the Databases course. Students are assigned to implement applications based on relational and non-relational databases.

Calculation of ECTS points

Activity form	Activity hours
Project	45

Preparation of a project	40
Preparation of a report/summary/presentation/paper	5
Self-study of class topics	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Mobile Applicaton Development PRO

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.18PK.00280.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Project: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Can find the software, technical documentation, and information necessary to complete the development tasks related to mobile platforms.	K1IBM_U04, K1IBM_U12
PEU_U02	Can implement mobile apps which make use of Internet communication protocols, relational and non-relational databases.	K1IBM_U04, K1IBM_U12
PEU_U03	Can implement Mobile Health Android apps.	K1IBM_U04, K1IBM_U12

Program content ensuring learning outcomes

The course includes project-based sessions aimed at introducing students to mobile application programming for the Android platform. Throughout the course, participants will gain both theoretical knowledge and practical skills essential for designing and developing mobile applications. Students will learn the basics of the Kotlin language, principles of user interface (UI) design, implementation of key application functionalities, and integration with databases and web services. The acquired

knowledge and skills will allow participants to create mobile applications, with a particular focus on mHealth solutions.

Calculation of ECTS points

Activity form	**Activity hours**
Project	45
Preparation of a project	40
Preparation of a report/summary/presentation/paper	5
Self-study of class topics	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Introduction to Bioinformatics LEC

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.18PK.00282.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Lecture: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has theoretically founded general knowledge including the use of computational methods in the field of biological sequence processing.	K1IBM_W08

Program content ensuring learning outcomes

The course includes a lecture and laboratory classes, which aim to provide participants with basic knowledge of molecular bioinformatics, and will include classical problems solved by such methods and algorithmic solutions. During practical classes, course participants will acquire skills in the implementation of algorithms and develop their programming skills in one of the classical programming languages, as well as the use of existing libraries. Thanks to the acquired knowledge and practice, after completing the course, participants will be able to effectively implement algorithms in a selected programming environment, which will enable them to process basic biomolecular data, and improve their general programming skills.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Prepararation for an exam/credit	28
Conducting literature research	5
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Introduction to Bioinformatics LAB

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.18PK.00283.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Laboratory: 30 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Can correctly and effectively use the theoretical knowledge to build their own algorithm and effectively implement it.	K1IBM_U03
In terms of social competences		
PEU_K01	Can formulate opinions on the basic issues of bioinformatics.	K1IBM_K06

Program content ensuring learning outcomes

The course includes a lecture and laboratory classes, which aim to provide participants with basic knowledge of molecular bioinformatics, and will include classical problems solved by such methods and algorithmic solutions. During practical classes, course participants will acquire skills in the implementation of algorithms and develop their programming skills in one of the classical programming languages, as well as the use of existing libraries. Thanks to the acquired knowledge and practice, after completing the course, participants will be able to effectively implement algorithms in a selected programming environment, which will enable them to process basic biomolecular data, and improve their general

programming skills.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	30
Preparaton for classes	10
Self-study of class topics	10
Conducting empirical studies	50
Student workload	**Hours** 100

Wrocław University of Science and Technology

Time Series Analysis LEC

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.18PK.00285.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Lecture: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has deeper knowledge of statistical theory and methods particularly common in time series modelling and forecasting	K1IBM_W09
PEU_W02	Understands time-dependent seasonal components	K1IBM_W09
PEU_W03	Is able to interpret the results of an implemented analysis	K1IBM_W09
PEU_W04	Is aware of limitations and possible sources of errors in the analysis	K1IBM_W09

Program content ensuring learning outcomes

The course comprises a lecture. It aims to provide a basic knowledge of time series analysis and time series forecasting, and modelling.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Prepararation for an exam/credit	10
Self-study of class topics	23
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Time Series Analysis LAB

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.18PK.00286.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Laboratory: 30 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Can use Python in time series analysis.	K1IBM_U04
PEU_U02	Can apply auto-regressive and model averaging models.	K1IBM_U09
PEU_U03	Can forecast time series using Deep Learning methods.	K1IBM_U09
PEU_U04	Can extract time series' features using Wavelet transform.	K1IBM_U09

Program content ensuring learning outcomes

The course includes laboratory. Its aim is to acquire a basic knowledge of time series analysis and time series forecasting, and modelling.

Calculation of ECTS points

Activity form	Activity hours
Laboratory	30
Preparation of a project	25
Preparation of a report/summary/presentation/paper	25
Preparaton for classes	10
Self-study of class topics	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Digital Signal Processing

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.110PK.00287.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the methods of signal differentiation due to their general properties, distinguishes between signal classes, is able to choose appropriate methods of description and analysis of a specific signal.	K1IBM_W03
PEU_W02	Has knowledge of the basic concepts, transformations, methods, and algorithms of digital signal processing and is able to define their properties and the area of application.	K1IBM_W03
In terms of skills		
PEU_U01	Identifies problems in the field of signal processing, can effectively use basic digital methods and algorithms for the characterization and analysis of signals, as well as use them in simulation modelling when solving engineering tasks, can correctly interpret the obtained results.	K1IBM_U05, K1IBM_U09

PEU_U02	Can use the literature in the field of digital signal processing as well as the information contained in the DSP software help/documentation.	K1IBM_U05, K1IBM_U09
In terms of social competences		
PEU_K01	Is aware of the scope of his/her knowledge, is prepared to expand it.	K1IBM_K01

Program content ensuring learning outcomes

The course enables acquiring knowledge in the field of characterizing deterministic and random signals, methods of their analysis, basic algorithms, continuous and discrete transformations used in the theory and practice of digital signal processing, as well as acquiring skills in the field of application of digital signal processing methods and techniques to solve problems of simulation and analysis of a wide spectrum of signals.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	59
Credit/Exam	6
Student workload	**Hours** 125

Wrocław University of Science and Technology

Software Engineering

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.110PK.00288.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 30 h, 3 ECTS, Exam • Laboratory: 30 h, 3 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the fundamental concepts of software engineering and software development life cycle.	K1IBM_W04
PEU_W02	Has knowledge of the selected essential methodologies and techniques of software development and programming project management.	K1IBM_W09
In terms of skills		
PEU_U01	Can specify the requirements in a programming project related to medical informatics.	K1IBM_U03
PEU_U02	Can apply modern methodologies and techniques to design and develop an IT system related to medical informatics.	K1IBM_U12
PEU_U03	Can determine the correctness and quality of the software.	K1IBM_U04

In terms of social competences		
PEU_K01	Is ready to make decisions regarding the work organization in a group programming project and to critically evaluate the process.	K1IBM_K02
PEU_K02	Observes the professional ethics of a software developer in the field of medical informatics.	K1IBM_K06

Program content ensuring learning outcomes

The course includes a lecture, a laboratory class, and a project class whose goal is to provide the participants with knowledge and practical skills related to modern approaches to software development. The lecture will cover the concepts and methods used throughout the software development life cycle, starting from requirements specification through implementation and testing to deployment. In the laboratory class, the participants will gain practical skills in areas such as version control systems, working with application programming interfaces (APIs), building applications using a selected modern web framework, containerizing applications, and preparing documentation. In the project class, the participants will complete a group programming project related to medical informatics, applying agile methods for project and team management. The knowledge and skills gained in this course will enable the participants to develop software efficiently and manage the development process using current approaches and techniques.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Project	15
Preparaton for classes	11
Prepararation for an exam/credit	15
Preparation of a report/summary/presentation/paper	45
Preparation of a project	25
Credit/Exam	4
Student workload	**Hours** 175

Wrocław University of Science and Technology

Numerical Methods

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.110PK.00289.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 30 h, 3 ECTS, Graded credit • Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	He knows about the relationship between accuracy, stability and convergence.	K1IBM_W09
PEU_W02	Knows about error propagation in complex numerical algorithms.	K1IBM_W09
PEU_W03	Possesses knowledge of the application of interpolation to numerical differentiation and integration.	K1IBM_W09
In terms of skills		
PEU_U01	Is able to develop efficient and stable algorithms for finding roots of non-linear equations.	K1IBM_U09
PEU_U02	Is able to develop stable algorithms for solving linear systems of equations.	K1IBM_U09

PEU_U03	Is able to develop stable solution algorithms for ordinary differential equations.	K1IBM_U09
PEU_U04	Can perform numerical simulation of biological phenomena.	K1IBM_U08

Program content ensuring learning outcomes

The course comprises lecture and laboratory activities. It aims to understand the basic principles of numerical computing, including number representation and arithmetic operations, as well as modelling biological and physiological systems using linear algebra and ordinary differential equations.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Prepararation for an exam/credit	3
Self-study of class topics	10
Preparaton for classes	10
Preparation of a project	10
Preparation of a report/summary/presentation/paper	55
Credit/Exam	2
Student workload	**Hours** 150

Wrocław University of Science and Technology

Measurement Systems

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.130PK.00290.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 30 h, 2 ECTS, Graded credit

Semester	Activities, hours, ECTS and examination
Semester 6	• Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the structure, properties, and applications of biomedical measurement systems and basic knowledge of wired and wireless interfaces and protocols used in measurement systems.	K1IBM_W08
In terms of skills		
PEU_U01	Is able to select and communicate the elements of a measurement system, develop an algorithm to realize the measurement task and create software for virtual measurement instrument.	K1IBM_U03
In terms of social competences		

PEU_K01	Develops competencies in team collaboration and in improving methods of developing a strategy to solve the task assigned to the group.	K1IBM_K03

Program content ensuring learning outcomes

Completion of the course provides the knowledge and skills necessary to operate instruments, transducers and measurement cards for the development and implementation of measurement systems and virtual measurement instruments. The course participant acquires knowledge and skills in the use of wired and wireless interfaces and protocols in measurement networks and the acquisition as well as processing of measurement signals. During the laboratory exercises, participants acquire skills in implementing measurement algorithms and programming virtual measurement instruments using the LabVIEW graphical development environment.

Calculation of ECTS points

Semester 5

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	18
Credit/Exam	2
Student workload	**Hours** 50

Semester 6

Activity form	**Activity hours**
Laboratory	30
Preparaton for classes	5
Preparation of a report/summary/presentation/paper	15
Student workload	**Hours** 50

Wrocław University of Science and Technology

Sport activities 2

Educational subject description sheet

Basic information

Field of study wychowanie fizyczne	**Education cycle** 2025/2026
Speciality -	**Subject code** PWRSWFS.83CWF.04469.25
Organizational unit Wrocław University of Science and Technology	**Group of classes** Yes
Study level first degree	**Lecture languages** English
Study form full-time studies	**Mandatoriness** Elective
Education profile general academic profile	**Block** Physical education classes

Semesters Semester 3, Semester 4, Semester 5, Semester 6	**Examination** Graded credit **Activities and hours** Classes: 30	**Number of ECTS points** 0.0

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The participant knows how to organize health-promoting training according to his or her interests, using the principles of a selected sports discipline or form of recreation.	SWF_S1_U01
PEU_U02	The student knows training methods that develop motor skills using their own body weight and various equipment.	SWF_S1_U01
PEU_U03	The student knows the basic technique of shaping exercises needed to prepare the body for physical exercise.	SWF_S1_U01
PEU_U04	The student knows the basic rules of safe behavior during physical activity.	SWF_S1_U01
PEU_U05	The student is able to develop a short- and long-term training plan adequate to his or her abilities.	SWF_S1_U01

PEU_U06	The student knows the principles of strengthening the deep and peripheral stabilization apparatus and the technique of basic exercises shaping aerobic and strength capacity.	SWF_S1_U01

Program content ensuring learning outcomes

Sports activities – ABT, aikido, badminton, bodyART, body ball, Brazilian Jiu Jitsu, Callanetics, cuban salsa fit, futsal, yoga, jogging, judo, karate, basketball, bodybuilding, athletics, body shaping, skiing, Nordic walking, pilates, football, handball, volleyball, swimming, pump, rugby, self-defense, shape, squash, stretch-one, ballroom dancing, table tennis, tennis, functional training, health-promoting training, mountain hiking, cycling tourism, floorball, rowing, climbing, corrective classes, Zumba, corrective classes for students with disabilities.

Calculation of ECTS points

Activity form	**Activity hours**
Classes	30
Student workload	**Hours** 30

Wrocław University of Science and Technology

Network Technologies PRO

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.110PK.00292.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Project: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Is able to implement web application in client-server model.	K1IBM_U04, K1IBM_U12

Program content ensuring learning outcomes

The course comprises projects aimed at practical application of skills and knowledge gained in the Network Technologies course. Students are assigned to implement web applications using databases.

Calculation of ECTS points

Activity form	Activity hours
Project	45

Preparation of a project	40
Preparation of a report/summary/presentation/paper	5
Self-study of class topics	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Cross-Platform Mobile Application Development

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.110PK.00293.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Project: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Has knowledge of the principles of programming in Dart.	K1IBM_U04
PEU_U02	Can run applications on different devices.	K1IBM_U04
PEU_U03	Can implement mobile apps which make use of Internet communication protocols, device features, and databases.	K1IBM_U04, K1IBM_U12
PEU_U04	Can implement Mobile Health apps.	K1IBM_U04, K1IBM_U12

Program content ensuring learning outcomes

The course comprises project. Its aim is to provide an introduction to programming in the Dart language (Flutter software) for multi-platform software development.

Calculation of ECTS points

Activity form	Activity hours
Project	45
Preparation of a project	40
Self-study of class topics	10
Preparaton for classes	5
Student workload	**Hours** 100

Wrocław University of Science and Technology

Computer Graphics LEC

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.110PK.00295.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the basic concepts of computer graphics (raster/vector graphic, primitives, projection, perspective, modeling and transformation in two and three dimensions, shaders, UV mapping, particle systems).	K1IBM_W09
PEU_W02	Can describe the fundamentals of animation (including physics-based). Understand the difference between render engine approaches - rasterization, raytracing, pathtracing.	K1IBM_W04, K1IBM_W09
PEU_W03	Is familiar with available graphics APIs and the knowledge to design computer graphics using programming techniques.	K1IBM_W04, K1IBM_W09
PEU_W04	Has knowledge of the principles behind tools for the creation of generative 2D graphics.	K1IBM_W09

Program content ensuring learning outcomes

The course includes a lecture to give participants knowledge of 3D computer graphics creation. This applies to the front-end - modeling mesh objects, applying materials and textures using shaders, setting up lights and cameras of the scene, particle systems, animation basics, designing physically realistic animations, principles of rendering engines. In this aspect, participants will be introduced to Blender software. In further stage, participants will gain basic knowledge of the back-end of computer graphics using Vulkan/OpenGL API, specifically understanding the functioning of the so-called graphical pipeline and simple transformations. In addition, participants will be introduced to the use of AI models for generating and processing 2D graphics using Stable Diffusion model with Automatic1111 webgui. With the acquired knowledge, participants will be able to generate graphics and schemes for reports, reports and theses, as well as gain knowledge in preparing and processing models for 3D printing.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Self-study of class topics	13
Preparaton for classes	20
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Computer Graphics LAB

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.110PK.00296.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Is able to perform basic 3D graphics tasks - mesh object modeling, 3D and 2D transformation, UV mapping, material and texture modeling with shaders, lighting modeling, particle systems and animation basics using Blender environment.	K1IBM_U04
PEU_U02	Is able to apply the available graphics APIs and use them to design computer graphics using programming techniques.	K1IBM_U04
PEU_U03	Is able to use available tools to create generative 2D graphics.	K1IBM_U04

Program content ensuring learning outcomes

The course includes a lab to give participants practical skills in 3D computer graphics creation and design. This applies to the front-end - modeling mesh objects, applying materials and textures using shaders, setting up lights and cameras of the scene, particle systems, animation basics, designing physically realistic animations. In this aspect, participants will be introduced to Blender software. In further stage, participants will gain basic skills of the back-end of computer graphics using

Vulkan/OpenGL API, specifically understanding the functioning of the so-called graphical pipeline and simple transformations. Finally, participants will use AI models to generate and process 2D graphics using the example of Stable Diffusion model with Automatic1111 webgui. With the acquired knowledge and practical skills, participants will be able to generate supporting graphics and schemes for reports, reports and theses, as well as gain knowledge in preparing and processing models for 3D printing.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	45
Preparation of a report/summary/presentation/paper	35
Preparaton for classes	15
Preparation of a project	5
Student workload	**Hours** 100

Wrocław University of Science and Technology

Elements of Nonlinear Dynamics LEC

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.110PK.00298.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge related to construction of models of nonlinear dynamics.	K1IBM_W01
PEU_W02	Has knowledge related to basic concepts of nonlinear dynamics.	K1IBM_W01

Program content ensuring learning outcomes

The student will become familiar with basic concepts of nonlinear dynamics: flows, fixed points, linear stability analysis, phase portraits, limit cycles, bifurcations, chaos, strange attractors, Lyapunov exponent. Famous equations leading to nonlinear dynamics will be presented and discussed.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Preparaton for classes	10
Self-study of class topics	10
Prepararation for an exam/credit	13
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Elements of Nonlinear Dynamics LAB

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.110PK.00299.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory in module
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Has basic skills to model nonlinear dynamics phenomena with Maple.	K1IBM_U09
PEU_U02	Has skills to use existing Maple worksheets to analyze nonlinear effects in physical, chemical, and biomedical systems.	K1IBM_U09

Program content ensuring learning outcomes

Student will become familiar with modeling of nonlinear phenomena with Computer Algebra System Maple.

Calculation of ECTS points

Activity form	Activity hours

Laboratory	45
Self-study of class topics	15
Preparaton for classes	15
Preparation of a project	25
Student workload	**Hours** 100

Wrocław University of Science and Technology

Modelling of Biological Systems

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.120PK.00300.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 15 h, 2 ECTS, Exam • Laboratory: 30 h, 3 ECTS, Graded credit • Seminar: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Can correctly and effectively use the previously known programming tools to analyze the presented models of biological processes.	K1IBM_W08
PEU_W02	Is able to model selected biological phenomena based on the literature values of the parameters of a given process.	K1IBM_W08
In terms of skills		
PEU_U01	Can correctly and effectively apply the learned principles and laws of physics and biochemistry to the qualitative and quantitative analysis of practical engineering issues in the field of biomedical engineering.	K1IBM_U08, K1IBM_U09

PEU_U02	Can correct and efficiently solve simple biophysical, physiological or biomedical problems. Can correctly interpret the results obtained during the experiment and assess their credibility relating to social competences.	K1IBM_U08, K1IBM_U09
In terms of social competences		
PEU_K01	Is able to work in a team, is aware of taking responsibility for jointly performed tasks.	K1IBM_K03

Program content ensuring learning outcomes

The course covers selected elmenets of *in silico* modeling of biological systems. The class is designed to give participants the knowledge and practical skills to apply selected methods to solve biophysical and biochemical problems. The participant will gain knowledge and skills in such techniques as molecular dynamics, protein folding, pharmacokinetics, Monte Carlo, epidemiological models. In addition, as part of the seminar activities, participants will be required to perform a literature study and present modern aspects or alternative approaches to the techniques described. With the acquired knowledge and practice, the students will have the knowledge and possess skills to use various techniques to solve biophysical, biochemical and physiological problems, which will enable them to model and analyze biological systems using *in silico* techniques.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Seminar	30
Credit/Exam	4
Preparation of a report/summary/presentation/paper	40
Preparaton for classes	31
Conducting literature research	20
Prepararation for an exam/credit	10
Self-study of class topics	20
Student workload	**Hours** 200

Wrocław University of Science and Technology

Conversion and Analysis of Non-Electrical Signals

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.120PK.00301.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 30 h, 2 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Defines terms related to the conversion of non-electrical signals.	K1IBM_W03
PEU_W02	Explains the phenomena and methods used to process and collect non-electrical signals.	K1IBM_W09
In terms of skills		
PEU_U01	Identifies and interprets the most important non-electrical signal conversion processes.	K1IBM_U06, K1IBM_U08, K1IBM_U09
PEU_U02	Plans and selects an experiment aimed at converting non-electrical signals used in medicine.	K1IBM_U06, K1IBM_U08, K1IBM_U09
In terms of social competences		

PEU_K01	Is open to the need for continuous learning, including self-education; knows and understands the need to learn independently and in a group.	K1IBM_K01
PEU_K02	Is able to work independently and in a group.	K1IBM_K02

Program content ensuring learning outcomes

The course includes lectures and practical classes aimed at providing students with knowledge and skills in the field of non-electrical signal processing used in medicine. Students will learn about the basic physical phenomena that enable the conversion of non-electrical physical quantities into electrical signals, as well as the principles of operation of simple sensors and transducers and their applications. The course develops skills in designing and testing basic sensors and transducers, as well as teaching literature analysis and effective presentation of knowledge about various applications of these devices. After completing the course, participants will be able to independently design and evaluate simple measurement systems and present the application possibilities of sensors in engineering practice.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	13
Preparation of a report/summary/presentation/paper	25
Credit/Exam	2
Student workload	**Hours** 100

Wrocław University of Science and Technology

Medical Imaging Techniques

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.120PK.00302.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 15 h, 1 ECTS, Graded credit • Project: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the theoretical foundations of medical imaging.	K1IBM_W03
PEU_W02	Has knowledge of the basic concepts and principles in the field of industrial property; is able to use patent information resources in the field of Biomedical Engineering.	K1IBM_W03
In terms of skills		
PEU_U01	Is able to prepare well documented written elaborations on problems in the field of Biomedical Engineering, in particular medical imaging, in Polish or other foreign language used in international communications.	K1IBM_U06
PEU_U02	Can make a preliminary economic analysis of undertaken engineering activities in the field of biomedical engineering	K1IBM_U10

Program content ensuring learning outcomes

Obtain basic knowledge of medical imaging techniques. Acquire knowledge of the construction and operation of diagnostic devices used for medical imaging. Presentation of the possibilities of using techniques of imaging in medicine and physiotherapy.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Project	30
Preparaton for classes	5
Preparation of a project	15
Prepararation for an exam/credit	8
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Academic Writing

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.120PK.00303.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 6	• Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Has the ability to self-study, is able to independently plan his own lifelong learning.	K1IBM_U02
PEU_U02	Can search and correctly cite professional literature in the text.	K1IBM_U02
PEU_U03	Is able to prepare a scientific text.	K1IBM_U02
In terms of social competences		
PEU_K01	Is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide information to the public about technological progress and other aspects of engineering activities.	K1IBM_K05

Program content ensuring learning outcomes

The course includes a project that aims to acquire the participant's practical skills related to the writing and editing of scientific works, in particular the preparation of BSc thesis. Students will learn the rules of using source materials as well as searching and selecting appropriate scientific literature, planning the structure of a scientific work, writing, proofreading and editing

Calculation of ECTS points

Activity form	**Activity hours**
Project	15
Preparation of a project	5
Conducting literature research	3
Credit/Exam	2
Student workload	**Hours** 25

Wrocław University of Science and Technology

Diploma Work 1

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.120PK.00304.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	

Semester	Activities, hours, ECTS and examination
Semester 6	• Diploma thesis: 10 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has advanced knowledge of the facts and phenomena of Medical Sciences related to Biomedical Engineering, in the fields of Anatomy, Physiology, Propaedeutics of Medical Sciences, and Biology.	K1IBM_W03
PEU_W02	Has knowledge of engineering technologies, methods, techniques, tools and materials used in solving Biomedical Engineering tasks.	K1IBM_W03, K1IBM_W06
In terms of skills		
PEU_U01	Is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks within the discipline of Biomedical Engineering.	K1IBM_U03, K1IBM_U04, K1IBM_U10
PEU_U02	Can plan and organize individual and teamwork.	K1IBM_U03, K1IBM_U04, K1IBM_U10
In terms of social competences		

PEU_K01	Is able to critically evaluate his/her knowledge.	K1IBM_K01
PEU_K02	Is able to think and act in an entrepreneurial way, is ready to assess the importance of knowledge in solving cognitive and practical problems.	K1IBM_K04
PEU_K03	Takes care about the achievements and traditions of the profession.	K1IBM_K06

Program content ensuring learning outcomes

The course comprises a thesis. Its aim is for the students to acquire the ability to formulate an engineering/research question and to plan and manage their own work process.

Calculation of ECTS points

Activity form	**Activity hours**
Diploma thesis	10
Conducting literature research	2
Preparation of the thesis	60
Conducting empirical studies	3
Student workload	**Hours** 75

Wrocław University of Science and Technology

Statistical Methods in Bioengineering

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.120PK.00306.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge how to use the statistical tests in biomedical engineering.	K1IBM_W03
In terms of skills		
PEU_U01	Can obtain basic information on statistical methods from literature, databases and other source.	K1IBM_U03
PEU_U02	Can interpret the results and draw conclusions based on the results of selected statistical tests.	K1IBM_U03
PEU_U03	Can use information techniques to implement basic statistical methods.	K1IBM_U03

Program content ensuring learning outcomes

The course includes labs aimed at providing participants with knowledge and practical skills in basic statistical tests essential for analysing medical and biological data. Participants will gain skills in computer-based data processing and the correct interpretation of statistical analysis results. With the acquired knowledge and hands-on experience, participants will be able to effectively use statistical data processing techniques, prepare statistical reports, and draw conclusions based on the obtained results upon completing the course.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	30
Preparaton for classes	15
Self-study of class topics	15
Prepararation for an exam/credit	15
Student workload	**Hours** 75

Wrocław University of Science and Technology

Virtual Reality Programming

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.120PK.00307.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Is able to create Unity3D project with Extended Reality support and OpenXR plugin.	K1IBM_U04
PEU_U02	Is able to create C# script and implement basic classes, methods, and operations on Unity Game Objects.	K1IBM_U04
PEU_U03	Is able to test, debug, and build any Extended Reality application with Unity3D.	K1IBM_U04, K1IBM_U07
PEU_U04	Is able to use Unity Profiler to optimize application.	K1IBM_U04
PEU_U05	Is able to implement Extended Reality application in Unity3D at least for one XR headset.	K1IBM_U04, K1IBM_U07

Program content ensuring learning outcomes

The course comprises laboratory activities. Its aim is to introduce students to the Unity3D engine, the basic concepts of augmented reality applications ,and the cross-platform development of Augmented Reality with OpenXR. It will provide them with a basic knowledge of Unity scripting (C#) and a working knowledge of Unity physics and 3D rendering. The course content also covers applications of augmented reality in medicine.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	30
Self-study of class topics	10
Preparation of a report/summary/presentation/paper	35
Student workload	**Hours** 75

Wrocław University of Science and Technology

Artificial Intelligence 1 LEC

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.120PK.00309.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of basic concepts of modern machine learning (ML) and artificial intelligence (AI).	K1IBM_W09
PEU_W02	Has knowledge of essential algorithms and architectures in modern ML & AI.	K1IBM_W09
In terms of skills		
PEU_U01	The student can present and discuss ML- & AI-based solutions for biomedical engineering problems.	K1IBM_U05

Program content ensuring learning outcomes

The course introduces fundamental concepts, algorithms, and architectures of modern machine learning (ML) and artificial intelligence (AI). It presents essential methods for designing, implementing, and testing ML- and AI-based solutions. The topics are presented in the context of challenges in the broadly understood field of biomedical engineering.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Preparaton for classes	5
Preparation of a project	4
Preparation of a report/summary/presentation/paper	5
Prepararation for an exam/credit	5
Self-study of class topics	24
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Artificial Intelligence 1 LAB

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.120PK.00310.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student can design, implement, test and evaluate relatively simple ML- & AI-based solutions for biomedical engineering problems using modern software platforms	K1IBM_U08
PEU_U02	The student can discuss solutions based on machine learning and artificial intelligence and the obtained results of computational experiments.	K1IBM_U08

Program content ensuring learning outcomes

The course covers practical learning of the fundamentals of designing, implementing, and testing solutions based on machine learning (ML) and artificial intelligence (AI), with a focus on biomedical engineering problems, using modern software platforms.

Calculation of ECTS points

Activity form	Activity hours
Laboratory	30
Self-study of class topics	8
Preparaton for classes	4
Preparation of a project	10
Conducting empirical studies	8
Preparation of a report/summary/presentation/paper	15
Student workload	**Hours** 75

Wrocław University of Science and Technology

Complex Systems LEC

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.120PK.00312.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory in module
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Presents knowledge related to the concept of complex systems and the relationships between different approaches to complex systems.	K1IBM_W09
PEU_W02	Presents knowledge necessary to design, develop, verify, and validate models of complex systems.	K1IBM_W09

Program content ensuring learning outcomes

The course includes lectures aimed at introducing selected topics related to the modeling and analysis of complex systems. During the sessions, participants will gain theoretical knowledge and practical skills in applying various methods for describing, simulating, and analyzing nonlinear and emergent phenomena. Participants will learn techniques such as nonlinear dynamics, agent-based modeling, Monte Carlo simulations, cellular automata, as well as the analysis and modeling of complex networks. Additionally, the course will cover practical applications of these methods in various fields, such as biology and social sciences. To pass the course, participants will be required to complete a team project in which they will

develop and present a practical application of selected techniques. With the knowledge and experience gained, graduates will be able to model and analyze diverse complex systems using advanced simulation and analytical methods, enabling them to effectively solve interdisciplinary problems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Preparation of a project	33
Preparation of a report/summary/presentation/paper	10
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Complex Systems LAB

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.120PK.00313.25

Lecture languages
English

Mandatoriness
Obligatory in module

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Develops, analyzes, modifies, verifies, and utilizes models of complex systems.	K1IBM_U04, K1IBM_U09
PEU_U02	Plans research, works in a team, and leads discussions.	K1IBM_U09

Program content ensuring learning outcomes

The course includes computer laboratories designed to provide participants with hands-on experience in selected techniques for modeling and analyzing complex systems. During the sessions, participants will develop skills in using tools and methods for data analysis, simulation, and modeling of nonlinear and emergent phenomena. The course covers topics such as nonlinear dynamics, agent-based modeling, Monte Carlo simulations, cellular automata, and the analysis and modeling of social networks.
Participants will have the opportunity to work with real-world datasets, exploring their structure and dynamics. To complete the course, participants will be required to regularly perform tasks involving data analysis and presentation, such as analyzing social networks, as well as modeling and analyzing various phenomena. With the acquired knowledge and

experience, graduates will be able to effectively apply advanced data analysis and modeling methods, enabling them to address complex problems in an interdisciplinary context.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	30
Preparaton for classes	15
Preparation of a report/summary/presentation/paper	30
Student workload	**Hours** 75

Wrocław University of Science and Technology

Legal and Ethical Aspects in Biomedical Engineering

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.140PK.00314.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the general principles of creating and developing forms of individual entrepreneurship, using knowledge in the field of science and scientific disciplines appropriate for Biomedical Engineering	K1IBM_W08
In terms of skills		
PEU_U01	Is able - when formulating and solving engineering tasks in the field of Biomedical Engineering - to notice their systemic and non-technical aspects	K1IBM_U10
In terms of social competences		
PEU_K01	Initiates actions for the benefit of the public interest	K1IBM_K04

Program content ensuring learning outcomes

A course devoted to the issues of creating documentation required for the approval of a medical device on the market. It discusses, among others: Regulation of the European Parliament and of the Council of the European Union on medical devices (MDR - Medical Device Regulation (EU 2017/745)), which replaces the Medical Devices Directive MDD (Medical Devices Directive (93/42/EEC)), and the polish Medical Devices Act (Ustawa o wyrobach medycnzych). The aim of the course is to familiarize participants with the mechanisms of introducing a common regulatory framework for the medical device market throughout the European Union by establishing high quality and safety standards and unifying the rules for introducing medical devices to the market and use.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	15
Preparation of a report/summary/presentation/paper	5
Self-study of class topics	5
Student workload	**Hours** 25

Wrocław University of Science and Technology

Diploma Seminar

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00315.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Seminar: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Describes key concepts in biochemistry, biophysics, biomedical signal processing, and techniques for analyzing and visualizing medical data. The student justifies the selection of data processing algorithms and their application in specific biomedical engineering problems.	K1IBM_W03
PEU_W02	Identifies the principles of copyright and industrial property law and indicates ways to use patent information in the context of projects related to medical data analysis and information systems in biomedical engineering.	K1IBM_W07
In terms of skills		
PEU_U01	Able to carry out engineering projects in the field of Biomedical Engineering.	K1IBM_U01, K1IBM_U03, K1IBM_U06
PEU_U02	He has the ability and willingness to learn, and is able to plan tasks related to the thesis.	K1IBM_U01, K1IBM_U03, K1IBM_U06

PEU_U03	Can solve a variety of tasks related to the thesis through the proper selection of sources and information from them, can skillfully apply the acquired scientific information, can communicate using specialized terminology in the field of Biomedical Engineering, can communicate with the public, justify his position.	K1IBM_U01, K1IBM_U03, K1IBM_U06
PEU_U04	Able to apply knowledge to carry out research in Biomedical Engineering through the selection and application of appropriate methods and tools, including advanced information and communication techniques, able to present and evaluate and discuss various opinions and positions within the discipline of Biomedical Engineering.	K1IBM_U01, K1IBM_U03, K1IBM_U06
In terms of social competences		
PEU_K01	He is ready to make decisions independently, critically evaluate his own actions and accept responsibility for the consequences of those actions.	K1IBM_K04, K1IBM_K05
PEU_K02	He is able to think and act in an entrepreneurial manner and is ready to evaluate the importance of knowledge in solving cognitive and practical problems.	K1IBM_K04, K1IBM_K05
PEU_K03	Is aware of the social role of a graduate of a technical university, and in particular understands the need to formulate and communicate to the public, especially through the mass media, information and opinions on the achievements of technology and other aspects of engineering activity; makes efforts to communicate such information and opinions in a commonly understood manner.	K1IBM_K04, K1IBM_K05

Program content ensuring learning outcomes

The course develops skills in the implementation and presentation of engineering projects. Students learn to select sources, plan project stages, critically analyze and discuss results. They are introduced to modern methods used in Biomedical Engineering, particularly in Medical Informatics.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparaton for classes	15
Preparation of a report/summary/presentation/paper	5
Student workload	**Hours** 50

Wrocław University of Science and Technology

Diploma Work 2

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00316.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Diploma thesis: 30 h, 12 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has advanced knowledge of the facts and phenomena of Medical Sciences related to Biomedical Engineering, in the fields of Anatomy, Physiology, Propaedeutics of Medical Sciences, and Biology.	K1IBM_W03
PEU_W02	Has knowledge of engineering technologies, methods, techniques, tools and materials used in solving Biomedical Engineering tasks.	K1IBM_W03, K1IBM_W06
In terms of skills		
PEU_U01	Is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks within the discipline of Biomedical Engineering.	K1IBM_U03, K1IBM_U04, K1IBM_U10
PEU_U02	Can plan and organize individual and teamwork.	K1IBM_U03, K1IBM_U10
PEU_U03	Is able to provide a consistent, well-structured and -argued text of thesis.	K1IBM_U03, K1IBM_U04, K1IBM_U10

In terms of social competences		
PEU_K01	Is able to critically evaluate his/her knowledge.	K1IBM_K01
PEU_K02	Is able to think and act in an entrepreneurial way, is ready to assess the importance of knowledge in solving cognitive and practical problems.	K1IBM_K04
PEU_K03	Takes care about the achievements and traditions of the profession.	K1IBM_K06

Program content ensuring learning outcomes

The course comprises a thesis. It aims to give students the ability to plan and manage their own work process and to present and defend the results of their thesis.

Calculation of ECTS points

Activity form	**Activity hours**
Diploma thesis	30
Preparation of the thesis	270
Student workload	**Hours** 300

Wrocław University of Science and Technology

Practical Training

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.140PK.00317.25

Lecture languages
English

Mandatoriness
Obligatory elective

Block
Major-specific subjects

Semester	ECTS and examination
Semester 7	• 6 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks within the discipline of Biomedical Engineering.	K1IBM_U03, K1IBM_U10
PEU_U02	Can plan and organize individual and/or teamwork.	K1IBM_U07
PEU_U03	Can make a preliminary economic analysis of undertaken engineering activities in the field of biomedical engineering.	K1IBM_U10, K1IBM_U11
In terms of social competences		
PEU_K01	Is able to think and act in an entrepreneurial way, is ready to assess the importance of knowledge in solving cognitive and practical problems.	K1IBM_K03, K1IBM_K04
PEU_K02	Takes care about the achievements and traditions of the profession.	K1IBM_K06

Program content ensuring learning outcomes

The course aims to train the professional competences of students, preparing them to work as engineers in the fields of medical informatics and biomedical engineering. The course programme involves intensive practical activities in institutions related to these fields, where students will have the opportunity to apply the knowledge they have acquired in the core subjects as well as in their field of study. Course participants will be involved in real-world projects and assignments that will allow them to apply theory to practice and develop technical and analytical skills. The course will also provide the opportunity to assess skills in the context of real-world professional challenges, which will better prepare them for their future careers.

Calculation of ECTS points

Activity form	**Activity hours**
Realizacja praktyki zawodowej	150
Student workload	**Hours** 150

Wrocław University of Science and Technology

Computer Science in Medicine

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00319.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Elective
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Seminar: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of development trends and the most significant new developments in the field of Biomedical Engineering	K1IBM_W05
PEU_W02	Has theoretically grounded detailed knowledge related to selected issues in the field of information technology methods in medical diagnostics	K1IBM_W05
In terms of skills		
PEU_U01	Able to evaluate the usefulness and applicability of new developments in Biomedical Engineering when formulating and solving engineering tasks	K1IBM_U06
PEU_U02	Able to evaluate the usefulness and applicability of new developments in Biomedical Engineering when formulating and solving engineering tasks	K1IBM_U06
In terms of social competences		

PEU_K01	Is ready to critically evaluate the content received	K1IBM_K03, K1IBM_K05

Program content ensuring learning outcomes

The course "Informatics in Medicine" is implemented in the form of a seminar covering six main topics, spread over 15 hours of classes. To begin with, students attend an introductory seminar, during which the principles of the course are discussed and the topics of the papers are selected (1 hour). This is followed by a second seminar that explores synthesis, activity analysis and bioassays to understand the processes used in biomedical research (2 hours). The next class focuses on the mHealth revolution, including applications of mobile technologies in healthcare (4 hours). Later in the course, molecular methods in biology are discussed to better understand processes at the biomolecular level (2 hours). Students are then introduced to biomolecular modeling techniques that find application in drug discovery and pharmacology development (2 hours). The course concludes with a class on methods based on machine learning and artificial intelligence in medicine, which are increasingly important in diagnosis and therapy (4 hours).

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparaton for classes	10
Self-study of class topics	28
Preparation of a report/summary/presentation/paper	5
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Current Trends in Telemedicine

Educational subject description sheet

Basic information

Field of study
Medical Informatics

Speciality
-

Organizational unit
Faculty of Fundamental Problems of Technology

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W11MIPS.140PK.00320.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Seminar: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of concepts of telemedicine.	K1IBM_W05
In terms of skills		
PEU_U01	Is able to prepare and present an oral and multimedia presentation on a given subject related to the subject.	K1IBM_U06
In terms of social competences		
PEU_K01	Is able to use dedicated scientific literature.	K1IBM_K05
PEU_K02	Is capable discussing telemedicine solutions for biomedical engineering problems.	K1IBM_K03, K1IBM_K05

Program content ensuring learning outcomes

The course comprises a seminar. Its aim is to gain a basic knowledge of telemedicine.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparation of a report/summary/presentation/paper	10
Conducting literature research	30
Preparaton for classes	5
Student workload	**Hours** 75

Wrocław University of Science and Technology

Advanced Imaging Techniques LEC

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00322.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory in module
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knows how to extract, model, and analyze information from medical data and applications to help diagnosis, treatment, and monitoring of diseases.	K1IBM_W03

Program content ensuring learning outcomes

The course comprises a lecture aimed at providing an overview of the current state of the art in medical analysis and imaging.

Calculation of ECTS points

Activity form	Activity hours

Lecture	30
Self-study of class topics	28
Prepararation for an exam/credit	15
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Advanced Imaging Techniques LAB

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00323.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory in module
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Can perform image enhancement, feature extraction and selection, segmentation, and image-based classification.	K1IBM_U06, K1IBM_U10

Program content ensuring learning outcomes

The course comprises a laboratory aimed at acquiring skills in advanced medical image analysis.

Calculation of ECTS points

Activity form	Activity hours
Laboratory	30

Preparation of a report/summary/presentation/paper	30
Self-study of class topics	15
Student workload	**Hours** 75

Wrocław University of Science and Technology

Artificial Intelligence 2 LEC

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00325.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory in module
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student knows the current state of the art of artificial intelligence (AI) for biomedical engineering.	K1IBM_W10
In terms of social competences		
PEU_K01	The student can follow and critically assess ongoing research in AI for biomedical engineering.	K1IBM_K05
PEU_K02	The student is aware of technological and social issues related to application of AI methods to biomedicine.	K1IBM_K05
PEU_K03	The student can present and discuss emerging technological and social issues related to application of AI methods to biomedicine.	K1IBM_K05

Program content ensuring learning outcomes

The course covers the current state of knowledge on artificial intelligence in biomedical engineering, as well as raising awareness of the technological and social aspects related to the application of AI methods in biomedicine.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Preparaton for classes	9
Preparation of a report/summary/presentation/paper	8
Conducting literature research	8
Self-study of class topics	18
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Artificial Intelligence 2 LAB

Educational subject description sheet

Basic information

Field of study Medical Informatics	**Education cycle** 2025/2026
Speciality -	**Subject code** W11MIPS.140PK.00326.25
Organizational unit Faculty of Fundamental Problems of Technology	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory in module
Study form full-time studies	**Block** Major-specific subjects
Education profile general academic profile	**Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Laboratory: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student can conduct the process of development of AI-based software, also as a biomedical product.	K1IBM_U07
PEU_U02	The student can document stages of the AI software-related project.	K1IBM_U07
PEU_U03	The student can follow and critically assess new scientific and technological achievements in AI for biomedical engineering.	K1IBM_U07
PEU_U04	The student can present and discuss technological and social issues related to application of AI methods to biomedicine.	K1IBM_U07

Program content ensuring learning outcomes

The course includes practical exercises on selected stages of the artificial intelligence software development process, with an emphasis on factors affecting solution quality and considering commercialization perspectives. The tasks are carried out

in teams.

Calculation of ECTS points

Activity form	**Activity hours**
Laboratory	30
Self-study of class topics	5
Conducting literature research	5
Preparation of a project	12
Conducting empirical studies	10
Preparation of a report/summary/presentation/paper	6
Preparaton for classes	7
Student workload	**Hours** 75