Wrocław University of Science and Technology

Study programme

Organizational unit:	Faculty of Electronics, Photonics and Microsystems
Field of study:	Electronic and Computer Engineering
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 Electronics, Photonics and Microsystems
Field of study:	Electronic and Computer Engineering
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
Total number of hours of classes:	2460
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
Control Engineering, Electronics, Electrotechnics and Space Technologies	100%

Main discipline: Control Engineering, Electronics, Electrotechnics and Space Technologies

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

Electronic and Computer Engineering (EAC) is a modern study program at the Faculty of Electronics, Photonics and Microsystems at Wrocław University of Science and Technology, conducted in English. The curriculum integrates practical knowledge and theoretical foundations from fields such as electronics, computer science, automation and robotics, optoelectronics, and telecommunications. The combination of these disciplines reflects the latest trends in electronics, where analog systems merge with digital ones, and software integrates with mechanical systems. Graduates of the program are well-versed in concepts like the Internet of Things, Industry 4.0, and AI algorithms.

A wide range of elective courses allows students to tailor their studies to their desired profile. Graduates of the EAC program are capable of designing, implementing, testing, and operating analog, digital, and mixed electronic circuits using electronic and optoelectronic components, integrated circuits, and microprocessors. They can plan and design measurement systems, optimize measurement conditions, and analyze and interpret research results. They are also skilled in applying IT tools (including those based on AI) for data acquisition, process control, design, commissioning, and maintenance of automation and industrial robotics systems with information exchange based on standard data transmission protocols.

EAC graduates have the opportunity to continue their education in second-level studies, including the Advanced Applied Electronics (AAE) program offered by the faculty.

Currentness of the study programme

Concept and goals of education

The EAC program combines the best of computer science, electronics, and robotics. The program's concept involves educating students across four main pillars:

- Programming: in structured languages (C, C++) and object-oriented languages (C#, JAVA), low-level (assembler) and high-level (Python) languages, as well as programming embedded systems (FPGA),
- AI/ML: implementation of artificial intelligence algorithms (machine learning and neural networks) for data processing, image recognition, process optimization, etc.,
- Electronics: designing, implementing, testing, and operating analog and digital electronic circuits,
- Automation and Robotics: designing and programming robotic systems, controllers (e.g., PLCs), control systems, and measurement systems (including the Internet of Things, smart buildings).

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

EAC is a study program combining knowledge in electronics and computer science, preparing graduates for work in the modern, dynamically developing technology sector. The curriculum is designed to meet socio-economic needs, considering both the latest technological trends and market requirements. Students acquire skills in the design and implementation of electronic systems, microcontrollers, digital circuits, and programming. The program also places significant emphasis on issues related to the Internet of Things (IoT), artificial intelligence, and photonics. Through close cooperation with the industry, including projects such as the team-based project, students have the opportunity to participate in projects carried out in collaboration with leading technology companies in the region, allowing them to gain practical experience and better prepare for professional challenges. This program addresses the market demand for specialists capable of creating innovative technological solutions that have a real impact on economic and social development. Graduates of Electronic and Computer Engineering are prepared to work in various sectors, from telecommunications and the automotive industry to the IT sector, where they can develop modern technologies supporting societal and economic growth.

The EAC study program aligns with the trends indicated in the National Smart Specializations (KIS), i.e., areas preferentially supported for the development of research, development, and innovation. These include KIS 9 "Electronics and Photonics", KIS 10 "Information, Communication, and Geoinformation Technologies", and KIS 11 "Automation and Robotics."

The job market for graduates with a degree in Electronic and Computer Engineering covers the entire country, the Lower Silesian Region, and Wrocław. The curriculum includes all the important needs and requirements of the job market for electronics and specialized IT professionals. The program also fits within the Lower Silesian Smart Specializations, adopted in the Lower Silesian Innovation Strategy 2030, particularly in areas such as 4. Machinery and Equipment, 6. Industry 4.0, and 7. Technology-Assisted Life. This highlights the importance of the program for the Lower Silesian region. A significant number of small and medium-sized enterprises and production plants operate in the Lower Silesian Region, where engineering skills are recognized and will continue to be valued in the coming years. An additional advantage for graduates will be their advanced proficiency in English, which will expand their employment opportunities in the increasing number of foreign companies with research and development centers and/or production plants in Lower Silesia and throughout Poland.

Other important factors determining the validity of the study programme

The EAC study program combines practical knowledge and theoretical foundations from fields such as electronics, computer science, automation and robotics, optoelectronics, and telecommunications. The integration of these disciplines reflects the latest trends in the construction of the electronic devices that surround us. The constantly accelerating development of digital technologies makes programs like EAC essential for meeting socio-economic needs.The Program Committee ensures that the study program stays current with the latest trends in science and industry. Only scientist-practitioners, who have significant scientific achievements as well as industrial experience and numerous contacts with the economic environment, are involved in teaching the EAC courses. Thanks to ongoing consultations with the business community, also through the Faculty's Social Council (which includes representatives from key Wrocław-based companies in the electronics sector), the study program is updated to meet current market demands.

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

The key and overarching strategic goal in the area of education, as expressed in the document "Wrocław University of Science and Technology Strategy 2023-2030" is "to ensure the highest level of education for students and doctoral candidates at Wrocław University of Science and Technology, preparing them for roles as leaders in modern society and the economy, including through the individualization and internationalization of education, as well as the modernization and enhancement of its methods and forms." The study program for the EAC field fully aligns with the overarching and area-specific strategic goals expressed in the Strategy, particularly in the areas of:

- Internationalization of education - each year, 30-40 students from a dozen countries around the world begin their studies in this field. Students have the opportunity to attend lectures and presentations by scientists who are renowned and respected internationally.
- Modernization of teaching methods - students have access to top-tier laboratories equipped with the latest equipment, allowing them to develop their skills using the most current platforms used in the industry.
- Educational offerings that meet the needs of the economy - the Program Committee for the field continuously updates the study program based on information received from the business environment, adapting the curriculum to market demands by updating the course offerings.

The study program for the EAC field is fully consistent with the "Development Plan for the Faculty of Electronics, Photonics and Microsystems at Wrocław University of Science and Technology for 2024-2030", adopted by the Faculty Council, which defines the directions for the Faculty's educational development, particularly in terms of developing education based on flexible directional pathways with a wide range of elective courses, as well as broad internationalization and the involvement of industry specialists in the educational process.

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			
EAC_K1_W1	Describes the topics of mathematics, including mathematical analysis, algebra, geometry, probability theory, and numerical methods, necessary for the description, analysis, and synthesis of automation and robotics systems and the fundamental processes occurring within them.	P6S_WG, P6S_UW	
EAC_K1_W10	describes artificial intelligence algorithms and machine learning, including deep learning and neural networks, as well as their implementation in various programming environments.	P6S_WG, P6S_UW	P6S_WG_INŻ
EAC_K1_W2	explains issues of classical mechanics, wave motion, mechanics, optics, and electric and magnetic fields, as well as metrology, including the theory and techniques for measuring electrical and non-electrical quantities.	P6S_WG, P6S_UW	
EAC_K1_W3	Addresses the subjects of information technology techniques and is familiar with the fundamentals of engineering and methodologies for structured and object-oriented programming, including the basic tools and programming environments.	P6S_WG, P6S_UW	P6S_WG_INŻ
EAC_K1_W4	describes the principles of designing electronic devices, explains the operation and application of electronic components and sensors. Additionally, he/she deals with methods and programs for analyzing electronic circuits.	P6S_WG, P6S_UW	P6S_WG_INŻ
EAC_K1_W5	uses the terminology, explains the main tasks, techniques, and components in automation and robotics.	P6S_WG, P6S_UW	P6S_WG_INŻ
EAC_K1_W6	defines the subjects in telecommunications and defines fundamental concepts in wired, wireless, and optical telecommunications.	P6S_WG, P6S_UW	P6S_WG_INŻ
EAC_K1_W7	describes the main topics in digital signal processing theory for deterministic signals, as well as programming of microprocessors and microcontrollers.	P6S_WG, P6S_UW	P6S_WG_INŻ
EAC_K1_W8	characterizes the non-technical aspects of engineering activities and explains the principles of individual entrepreneurship.	P6S_WK, P6S_UK, P6S_UO, P6S_KO	P6S_WG_INŻ
EAC_K1_W9	Explains the computer network technologies, network protocols, and the design and configuration of computer networks.	P6S_WG, P6S_UW	P6S_WG_INŻ
Skills			
EAC_K1_U1	Independently solves and documents an engineering task using literature, materials, and equipment; applies matrix calculus, vector calculus, and differential and integral calculus; uses fast Fourier transform; performs operations on complex numbers.	P6S_UW	
EAC_K1_U10	Can distinguish between machine learning algorithms and implement selected algorithms in specific environments.	P6S_UW	P6S_UW_INŻ
EAC_K1_U11	Can independently use various foreign-language sources of information, particularly technical literature, and integrate the obtained information.	P6S_UW, 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
EAC_K1_U2	Can correctly and effectively apply the learned principles and laws of physics to the qualitative and quantitative analysis of engineering-related physical issues.	P6S_UW	
EAC_K1_U3	Is skilled in using information technology techniques, and can create object-oriented, multi-threaded, graphical, and mobile programs.	P6S_UW	P6S_UW_INŻ
EAC_K1_U4	Can design and implement a simple electrical or electronic device according to the given specification, using appropriate methods, techniques, and tools (including computer simulations).	P6S_UW	P6S_UW_INŻ
EAC_K1_U5	Can simulate and analyze basic automation and robotics objects using appropriate tools.	P6S_UW	P6S_UW_INŻ
EAC_K1_U6	Can present the structure of modern telecommunication networks and configure basic functionalities of selected systems.	P6S_UW	P6S_UW_INŻ
EAC_K1_U7	Can prepare and run software that utilizes the internal structure of microcontrollers.	P6S_UW	P6S_UW_INŻ
EAC_K1_U8	Can solve engineering tasks using acquired knowledge and skills, and can also gather information from other sources during self-education. When solving problems, considers non-technical aspects as well. Is able to create documentation for the solution and present it clearly and understandably.	P6S_WK, P6S_UK, P6S_UO, P6S_KO	P6S_UW_INŻ
EAC_K1_U9	Can differentiate between network devices and network services, design IP address schemes, and construct a simple computer network.	P6S_UW	P6S_UW_INŻ
Social competence			
EAC_K1_K1	Has an awareness of the importance and understanding of the humanistic aspects and consequences of engineering activities. Recognizes the effects of technical activities on the environment and the associated social responsibility of science and technology.	P6U_K, P6S_KO	
EAC_K1_K2	Correctly identifies and resolves dilemmas associated with the practice of the profession; is aware of the social role of a technical university graduate. Understands the need to formulate and communicate to society information and opinions regarding technological achievements and other aspects of engineering activities; is able to convey such information and opinions clearly, with justification of different viewpoints.	P6U_K, P6S_KO, P6S_KR	
EAC_K1_K3	Understands the legal aspects and implications of engineering activities.	P6S_KR	
EAC_K1_K4	Can collaborate with a team on complex engineering tasks, taking on various roles within the team, and can complete assigned tasks according to the project schedule.	P6S_KK	
Language and physical education outcomes			
SJO_S1_U01	Be able to use a foreign language at ESCJ level B2	P6S_UK	
SWF_S1_U01	Is aware of the importance of systematic physical activity for physical and mental health		

Detailed information on ECTS points

Electronic and Computer Engineering

Name	Value
Total ECTS	210
Total number of hours of classes	2460
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)	143/210 (68.1%)
Number of ECTS points allocated to classes developing practical skills (including laboratory, project) (P)	100.3
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)	106.7
Percentage of ECTS for elective courses	79/210 (37.62%)
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	6
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)	26

Organization of studies

Implementation of the study programme

Allowable ECTS deficit

Semester	Allowable deficit of ECTS points after a semester
Semester 1	11
Semester 2	11
Semester 3	11
Semester 4	11
Semester 5	11
Semester 6	0
Semester 7	0

Detailed requirements

All courses from semester 1 and 2 - need to be passed to semester 5 at latest.

Methods of verifying the intended learning outcomes

Activity form	Methods of verifying the intended learning outcomes
Seminar	Multimedia presentations conducted and prepared individually or in groups; case study analysis; class activity; written report
Classes	Credit - oral, written; test; entrance task; assessment of sub-tasks
Project	Project preparation; project implementation; project documentation; case study analysis
Diploma thesis	Evaluation of work during the preparation of the thesis; opinion and review
Internship	Internship report; internship logbook; confirmation of completion of internship program
Laboratory	Completion of laboratory reports; oral answers; class activity; test; entrance task; evaluation of sub-tasks
Lecture	Examination - oral, written; credit; colloquium - oral, written

Description of the process leading to achieving learning outcomes

While studying Electronic and Computer Engineering (EAC), students undertake various subjects according to the study plan. Each subject is described in the Course Cards (syllabi), which comply with the relevant Internal Regulation of the Rector of Wrocław University of Science and Technology regarding the documentation of study programs. The Course Cards contain the following information about the subjects:

- Learning outcomes assigned to these subjects,
- Program content ensuring the achievement of these outcomes,
- The number of hours and ECTS points assigned to the subject.

The methods for verifying and assessing the learning outcomes achieved by the student are established for all subjects. Each teacher responsible for the classes formulates the rules for passing the course by assigning appropriate verification and assessment methods to the learning outcomes. The set of subjects forming the study program includes the following forms of classes:

- Lectures conducted using modern techniques and the infrastructural resources of the Faculty and the University,
- Exercises where lecture material is demonstrated through practical examples,
- Laboratories where students gain practical experience (e.g., in constructing and testing electronic devices),
- Projects, carried out individually and in teams,
- Seminars where students present independently acquired knowledge that goes beyond the lecture material.

Different forms of classes correspond to various methods of verifying and assessing the degree of achievement of learning outcomes. Almost all forms of assessment listed in the internal regulations of Wrocław University of Science and Technology are used, such as written exams, oral exams, written quizzes, oral quizzes, tests, written reports, projects, presentations, homework, and assessment of participation during classes. The verification and assessment of learning outcomes achieved by the student during the entire learning cycle primarily take place at the level of individual subjects. Full coverage of the learning outcomes defined for the study program by the learning outcomes defined (and verified) for the subjects that make up the program ensures the verification of program-specific outcomes (learning outcomes achieved by the student during the entire learning cycle).

Internships

The purpose of the professional internship is to familiarize the student with the operation, work organization, and tasks performed in companies involved in electronics, software development, or the production, servicing, and operation of electronic and automated systems. The internship also aims to apply in practice the knowledge and skills that the student has acquired during their studies. The student should have the opportunity to practically apply the knowledge gained during their time at the Faculty. During the professional internship, the student should learn to work independently as well as to collaborate with a team of employees in the execution of tasks. For EAC students, an Internship Coordinator is available to assist with communication with companies and the formalities related to the professional internship.

Diploma exam

According to the Regulations of Studies at Wrocław University of Science and Technology, the diploma examination consists of a test of knowledge and skills through the verification of the degree of mastery of the educational content delivered during the course of study. The Program Committee prepares the list of topics for the diploma examination in consultation with the academic teachers who conduct classes in the respective subjects. The list of topics for the diploma examination is published on the Faculty's website.

Study plan

Electronic and Computer Engineering

Semester 1

In the first semester, students pursue mandatory subjects, much of it in the field of general education, which are preparation for the directional specialized subjects for subsequent semesters of study.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Metrology	Lecture: 15 Classes: 15 Laboratory: 30	Lecture: Graded credit Classes: Graded credit Laboratory: Graded credit	Lecture: 1 Classes: 1 Laboratory: 2	Obligatory
Introduction to Programming	Lecture: 30 Laboratory: 45	Lecture: Graded credit Laboratory: Graded credit	Lecture: 4 Laboratory: 4	Obligatory
Math - Algebra 1	Lecture: 30 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 5 Classes: 3	Obligatory
Mathematical Analysis 1	Lecture: 30 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 4 Classes: 3	Obligatory
Humanities Block	Lecture: 30	Graded credit	2	Obligatory group
The student chooses one subject				
Philosophy	Lecture: 30	Graded credit	2	Elective
Man and Challenges of Modern World	Lecture: 30	Graded credit	2	Elective
Sum	**285**		**29**	

Semester 2

In the second semester, students shall pursue mandatory subjects of general education and preliminary subjects of directional education; students shall also pursue sports and foreign language classes.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Electronics 1	Lecture: 30 Classes: 30	Lecture: Graded credit Classes: Graded credit	Lecture: 2 Classes: 2	Obligatory

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Object Oriented Programming	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Physics for Electronics	Lecture: 30 Classes: 30	Lecture: Graded credit Classes: Graded credit	Lecture: 3 Classes: 2	Obligatory
Physics	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 4 Laboratory: 2	Obligatory
Mathematical Analysis 2	Lecture: 30 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 3 Classes: 2	Obligatory
Foreign Language 1.1	Classes: 60	Graded credit	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
Sport activities	Classes: 30	Graded credit	-	Obligatory group
The student chooses one subject				
Sport activities 1	Classes: 30	Graded credit	-	Elective
Sum	**390**		**27**	

Semester 3

In the third semester, students complete mandatory subjects in their field of study. Students should also complete sports and foreign language classes.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Electronic Components	Lecture: 30 Classes: 15 Laboratory: 15	Lecture: Exam Classes: Graded credit Laboratory: Graded credit	Lecture: 2 Classes: 2 Laboratory: 2	Obligatory
Electronics 2	Lecture: 15 Classes: 15 Laboratory: 30	Lecture: Graded credit Classes: Graded credit Laboratory: Graded credit	Lecture: 1 Classes: 1 Laboratory: 2	Obligatory
Electronic Technology	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 3 Laboratory: 2	Obligatory

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Scientific and Engineering Programming	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 3 Laboratory: 2	Obligatory
Python	Lecture: 15 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 1	Obligatory
Math for Electronics	Lecture: 30 Classes: 30	Lecture: Graded credit Classes: Graded credit	Lecture: 2 Classes: 2	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 2	Classes: 30	Graded credit	-	Elective
Sum	**420**		**30**	

Semester 4

In the fourth semester, students pursue mandatory subjects in their field of study.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Sensors	Lecture: 15 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 1	Obligatory
Electronic Circuits	Lecture: 30 Laboratory: 30 Project: 30	Lecture: Exam Laboratory: Graded credit Project: Graded credit	Lecture: 4 Laboratory: 2 Project: 2	Obligatory
Software Engineering	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Fundamentals of Telecommunications	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Introduction to Logic and Microcontrollers	Lecture: 30 Classes: 15 Laboratory: 45	Lecture: Exam Classes: Graded credit Laboratory: Graded credit	Lecture: 4 Classes: 1 Laboratory: 3	Obligatory
Introduction to Automation	Lecture: 30 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 1	Obligatory
Introduction to Robotics	Lecture: 30 Classes: 15	Lecture: Graded credit Classes: Graded credit	Lecture: 2 Classes: 1	Obligatory
Sum	**420**		**32**	

Semester 5

In the fifth semester, from the field of directional education, students complete mandatory subjects and elective blocks.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Computer Networks	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Microcontrollers	Lecture: 30 Laboratory: 30 Project: 15	Lecture: Exam Laboratory: Graded credit Project: Graded credit	Lecture: 2 Laboratory: 2 Project: 1	Obligatory
Optional Courses 1	Lecture: 90 Total practical contact hours: 135	Graded credit	21	Obligatory group
The student chooses three subjects				
Advanced Topics in Robotics	Lecture: 30 Project: 30 Seminar: 15	Lecture: Graded credit Project: Graded credit Seminar: Graded credit	Lecture: 3 Project: 3 Seminar: 1	Elective
Digital Signal Processing	Lecture: 30 Laboratory: 45	Lecture: Graded credit Laboratory: Graded credit	Lecture: 3 Laboratory: 4	Elective
Artificial Intelligence and Computer Vision	Lecture: 30 Laboratory: 30 Project: 15	Lecture: Graded credit Laboratory: Graded credit Project: Graded credit	Lecture: 3 Laboratory: 3 Project: 1	Elective

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Optoelectronics	Lecture: 30 Project: 30 Seminar: 15	Lecture: Graded credit Project: Graded credit Seminar: Graded credit	Lecture: 3 Project: 3 Seminar: 1	Elective
Wireless Systems	Lecture: 30 Laboratory: 30 Project: 15	Lecture: Graded credit Laboratory: Graded credit Project: Graded credit	Lecture: 3 Laboratory: 3 Project: 1	Elective
Sum	**360**		**30**	

Semester 6

In the sixth semester, from the field of directional education, students complete mandatory subjects and from elective blocks. In the final period of the sixth semester, students choose a thesis topic for completion in the seventh semester. During the summer vacation period between the sixth and seventh semesters, students complete a Professional Practice.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Selected Topics in Deep Learning	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Team and Pre-Engineering Project	Project: 45	Graded credit	5	Obligatory
Optional Courses 2	Lecture: 90 Total practical contact hours: 135	Graded credit	18	Obligatory group
The student chooses three subjects				
Control Systems Engineering	Lecture: 30 Laboratory: 45	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 4	Elective
Embedded Systems	Lecture: 30 Laboratory: 45	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 4	Elective
Real-Time Operating Systems	Lecture: 30 Project: 45	Lecture: Exam Project: Graded credit	Lecture: 2 Project: 4	Elective
Lasers, Fibers and Applications	Lecture: 30 Project: 30 Seminar: 15	Lecture: Exam Project: Graded credit Seminar: Graded credit	Lecture: 2 Project: 3 Seminar: 1	Elective
Cybersecurity	Lecture: 30 Laboratory: 30 Seminar: 15	Lecture: Exam Laboratory: Graded credit Seminar: Graded credit	Lecture: 2 Laboratory: 3 Seminar: 1	Elective

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Electroacoustics	Lecture: 30 Laboratory: 45	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 4	Elective
EdgeAI	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory
Sum	**375**		**30**	

Semester 7

In the seventh semester, from the field of directional education, students complete mandatory subjects and elective blocks, including the Thesis. Students should complete subjects from the humanities and management block.

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Internship	-	Graded credit	7	Obligatory elective
Final Project	Diploma thesis: 30	Graded credit	12	Obligatory elective
Diploma Seminar	Seminar: 30	Graded credit	3	Obligatory elective
Optional Courses 3	Lecture: 60 Total practical contact hours: 30	Graded credit	6	Obligatory group
The student chooses two subjects				
Electrotechnics	Lecture: 30 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 1	Elective
Medical Electronics	Lecture: 30 Seminar: 15	Lecture: Graded credit Seminar: Graded credit	Lecture: 2 Seminar: 1	Elective
Electronics for Renewable Energy Sources	Lecture: 30 Seminar: 15	Lecture: Graded credit Seminar: Graded credit	Lecture: 2 Seminar: 1	Elective
Machine Learning	Lecture: 15 Project: 30	Lecture: Graded credit Project: Graded credit	Lecture: 1 Project: 2	Elective
Ultrasonic Technology	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Elective
Humanities Block	Lecture: 60	Graded credit	4	Obligatory group
The student chooses two subjects				

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Copyright	Lecture: 30	Graded credit	2	Elective
Entrepreneurship	Lecture: 30	Graded credit	2	Elective
Social Development Philosophy	Lecture: 30	Graded credit	2	Elective
Sum	**210**		**32**	

Syllabuses

Wrocław University of Science and Technology

Metrology

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.11PK.01895.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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: 15 h, 1 ECTS, Graded credit • Classes: 15 h, 1 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 basic concepts in metrology and explains methods for analyzing measurement results	EAC_K1_W2
PEU_W02	Presents the principles of measuring electrical and non-electrical quantities	EAC_K1_W2
In terms of skills		
PEU_U01	Applies basic laws and theorems to measuring circuits	EAC_K1_U2
PEU_U02	Plans and controls measurements of basic electrical quantities and analyzes measurement results	EAC_K1_U2

Program content ensuring learning outcomes

The subject describes the basic issues in the area of metrology, theory and technique of measuring electrical and non-electrical quantities. As a result of its implementation, students will be able to correctly and effectively apply the principles of measurement and analysis of their results to the qualitative and quantitative analysis of physical problems of an engineering nature.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	15
Laboratory	30
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	20
Self-study of class topics	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Introduction to Programming

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.11PK.00241.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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 1	• Lecture: 30 h, 4 ECTS, Graded credit • Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Explains issues related to modern programming languages and paradigms. Lists and explains fundamental principles and structures to represent algorithm in the form of flowcharts and textual programming languages. Knows the basic algorithms for searching, aggregation and sorting of the data.	EAC_K1_W3
PEU_W02	Identifies and explains the syntax, semantics, programming constructs and concepts specific to structured and procedural programming in C or C++. Understands concepts of iteration, recursion, memory organization, pointer arithmetic, dynamic resource allocation and release. Has the knowledge of the selected dynamic and complex data structures.	EAC_K1_W3
In terms of skills		

PEU_U01	Use correct structuring of the program code and data in C/C++, in accordance with the principles of structured and procedural programming. Creates and correctly invokes functions, choosing the right way of passing the input and output parameters. Properly defines, initializes and process basic data representations: arrays, strings, structures and their combinations.	EAC_K1_U3
PEU_U02	Uses the integrated development environment to configure, edit, and test single-threaded console applications.	EAC_K1_U3

Program content ensuring learning outcomes

1. Acquisition of basic knowledge on computer algorithms, how they are presented and analyzed. Getting familiar with standard algorithms processing large amounts of data, i.e.: searching, aggregating and sorting.
2. Learning the basic programming constructs which are common to most of algorithmic languages: types, variables, conditional branching, looping, functions with arguments, arrays, lists, files. Getting Acquainted with selected forms of dynamic and complex data structures.
3. Acquiring the ability of the structural and procedural programming in C or C++, and using the integrated development environments to improve the processes of editing, compiling and testing programming projects.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	45
Self-study of class topics	30
Preparaton for classes	45
Preparation of a project	50
Student workload	**Hours** 200

Wrocław University of Science and Technology

Math - Algebra 1

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.11PM.01896.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 5 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 a basic knowledge of mathematical logic and set theory	EAC_K1_W1
PEU_W02	has a basic knowledge of analytic geometry on a plane and in space	EAC_K1_W1
PEU_W03	knows the properties of complex numbers	EAC_K1_W1
PEU_W04	has a basic knowledge of linear algebra, knows matrix methods of solving of linear equations systems	EAC_K1_W1
PEU_W05	has knowledge of polynomial and rational functions, knows the basic theorem of algebra	EAC_K1_W1
In terms of skills		
PEU_U01	is able to use the knowledge of mathematical logic and set theory	EAC_K1_U1

PEU_U02	is able to determine the equation of surfaces and line in space and use vector calculus in the geometrical construction	EAC_K1_U1
PEU_U03	can perform calculations using various forms of complex numbers	EAC_K1_U1
PEU_U04	can use the matrix calculus, calculate determinants and solve systems of linear equations using linear algebra methods	EAC_K1_U1
PEU_U05	can decompose polynomial and rational function into partial fractions	EAC_K1_U1

Program content ensuring learning outcomes

Exposition of rudiments of mathematical logic and set theory.
Exposition of rudiments of analytic geometry in R^3.
Exposition of rudiments of the theory of complex numbers
Exposition of basic notions concerning matrix calculus with applications in linear equations.
Exposition of rudiments of the theory of polynomials and rational functions.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	70
Self-study of class topics	50
Prepararation for an exam/credit	16
Credit/Exam	4
Student workload	**Hours** 200

Wrocław University of Science and Technology

Mathematical Analysis 1

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.11PM.00243.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 4 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	knows the properties of the function; knows the methods of determining boundaries and asymptotes functions; familiar with the concept of continuity and discontinuity points classification	EAC_K1_W1
PEU_W02	knows the basics of differential calculus of functions	EAC_K1_W1
PEU_W03	has a basic knowledge of indefinite integral, knows the structure of the definite integral and its properties, he knows the concept of the improper integral	EAC_K1_W1
In terms of skills		
PEU_U01	is able to calculate limits of sequences and functions, set asymptote functions, use L'Hospital theorem to the indeterminate forms, check the continuity of functions	EAC_K1_U1

PEU_U02	can calculate the derivatives and interpret the results, can make use of the differential in the estimate calculus, can examine the property and conduct functions of one variable	EAC_K1_U1
PEU_U03	can determine the indefinite integral of elementary functions and rational functions, can calculate and interpret the definite integral, is able to solve engineering problems using integrals	EAC_K1_U1

Program content ensuring learning outcomes

Understanding the basic concepts and the differential and integral calculus of functions of one variable, and acquire the skills to use them to study the waveform functions and engineering calculations.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	55
Self-study of class topics	40
Prepararation for an exam/credit	16
Credit/Exam	4
Student workload	**Hours** 175

Wrocław University of Science and Technology

Philosophy

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.11HS.01899.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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 1	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of social competences		
PEU_K01	Student correctly identifies problems related to non-technical aspects and consequences of engineering activities and draws attention to their importance, including those resulting from the impact on the environment and related to the responsibility for one's decisions.	EAC_K1_K1
PEU_K02	Student understands the importance of the humanistic aspects of engineering activities and is aware of the effects of this activity; is aware of the environmental impact of technologies and related social responsibility.	EAC_K1_K1

Program content ensuring learning outcomes

1. Introduction to philosophy as a way o thinking about the world.
2. Discussion of fundamental problems in the fields of ethics, social philosophy, epitemology, metaphysics, argumentation

theory
and philosophy of science and technology.
3. Developing critical thinking skills.
4. Discussion of the social dimension of engineering and the problem of social responsibility of science and technology.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	10
Preparaton for classes	5
Prepararation for an exam/credit	5
Student workload	**Hours** 50

Wrocław University of Science and Technology

Man and Challenges of Modern World

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.11HS.05868.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

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 social competences		
PEU_K01	Student can explain the basic challenges of the modern world and how they are connected to the human condition. He can also explain how complicated these issues are and identify problems related to change.	EAC_K1_K1

Program content ensuring learning outcomes

The aim of the subject is to present the complexity of human functioning in the modern world, in its existential aspect, with particular emphasis on interactions with rapidly changing reality, in its various aspects. The issues discussed:

- picture (view) of the world
- place of man in the surrounding reality
- internal and external world
- interaction with science, new technologies, how being immersed in social and cultural processes and challeges connected with them

- fundamental existential issues

aim to shape critical thinking, as well as thinking oriented towards the human person in their existential whole and the development of analytical thinking, going beyond strictly engineering activities.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	11
Prepararation for an exam/credit	9
Student workload	**Hours** 50

Wrocław University of Science and Technology

Electronics 1

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.12PK.01900.25

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: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Defines and explains the basic theorems of circuit theory, explains methods of analyzing constant current (DC) and alternating current (AC) circuits with sinusoidal excitation. Defines the transmittance function of a basic electronic circuit and knows the physical sense of the frequency characteristics of the circuit.	EAC_K1_W4
In terms of skills		
PEU_U01	Can perform analysis of elementary constant current (DC) and alternating current (AC) circuits for sinusoidal excitations. Can use the symbolic method to analyze elementary linear circuits. Has the ability to analytically determine the transmittance function of a circuit and can determine its frequency characteristics.	EAC_K1_U4

Program content ensuring learning outcomes

In the scope of the course is to gain students knowledge of; methods of electrical and electronic circuits analysis with constant current (DC) and sinusoidal (AC) excitation, basic theorems of circuit theory and description of electronic circuit with transmittance function. The implementation of the subject will provide students with skills in free analysis of basic DC and AC electrical circuits, their conscious design based on calculations, understanding the essence of the phenomena occurring in them.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Self-study of class topics	20
Preparaton for classes	20
Student workload	**Hours** 100

Wrocław University of Science and Technology

Object Oriented Programming

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.12PK.01901.25

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, Exam • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Describes fundamentals and main elements of object oriented paradigm	EAC_K1_W3
PEU_W02	Explains good practises and important rules of object oriented programming	EAC_K1_W3
PEU_W03	Distinguishes a few object oriented design patterns	EAC_K1_W3
In terms of skills		
PEU_U01	Solves simple C++ programs which uses object oriented concepts	EAC_K1_U3
PEU_U02	Tests C++ programs using unit test approach	EAC_K1_U3
PEU_U03	Design a bigger application in object oriented way with use of good rules and practices	EAC_K1_U3

Program content ensuring learning outcomes

In the course students get comprehensive knowledge about object oriented programming paradigm including fundamentals as well as good practises, important rules and couple of design patterns. Students get also knowledge and practice of C++ programming language as an example language where they can use object oriented paradigm. Additionally, students gain ability to read diagrams drawn in UML (Unified Modeling Language) as well as knowing prons and cons of Object Oriented Programming paradigm.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Self-study of class topics	11
Preparaton for classes	5
Preparation of a project	20
Credit/Exam	4
Student workload	**Hours** 100

Wrocław University of Science and Technology

Physics for Electronics

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.12PK.01902.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 3 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	Uses the operational calculus	EAC_K1_W2
PEU_W02	Describes the laws and phenomena of electric and electro-flow fields, magnetic fields, Maxwell's equations, parameters and structure of plane waves, reflections and refractions of plane waves	EAC_K1_W2
In terms of skills		
PEU_U01	Explains of the practical aspects of electromagnetism important in engineering practice by the law of electromagnetism.	EAC_K1_U2

Program content ensuring learning outcomes

Vector algebra, coordinate systems, vector calculus– review.
Electrostatic field; forces in an electric field, Coulomb’s law, Gauss’s law, Poisson’s and Laplace law

Polarization, Dielectrics classification, Capacitance,
The current; point form and circuital Ohm law, resistivity, dependence of resistivity to temperature
Magnetic field; forces in magnetic field, Biota-Savart' law, Ampere's law, Faraday's law, inductance, transformers.
Elements of electrodynamic; Maxwell equations, magnetic dipole, vector of magnetization
Plane wave, electromagnetic wave propagation, waveguides, reflection and refraction. Resume

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	25
Conducting literature research	25
Prepararation for an exam/credit	15
Student workload	**Hours** 125

Wrocław University of Science and Technology

Physics

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.12PF.01903.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - physics

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

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	knows and can explain basic laws of point mass dynamics, point mass systems and a rigid body; knows properties of an oscillator and wave phenomena	EAC_K1_W2
PEU_W02	knows and can explain basic laws phenomenological thermodynamics and understands basic concepts of statistical thermodynamics (classical and quantum statistics)	EAC_K1_W2
PEU_W03	knows basic concepts of quantum mechanics and quantum optics; knows properties of real quantum systems (atom, molecule, crystal, nanostructures)	EAC_K1_W2
In terms of skills		
PEU_U01	can use simple measuring devices (for measuring length, time and other physical quantities)	EAC_K1_U2

PEU_U02	can perform the measurement of basic physical quantities with the use of the measuring system instruction	EAC_K1_U2
PEU_U03	can work out the measurement results and do the uncertainty analysis with the use of engineering tools	EAC_K1_U2

Program content ensuring learning outcomes

Acquiring basic knowledge of classical mechanics, phenomenological thermodynamics, concepts of statistical thermodynamics, quantum physics and condensed matter physics.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	30
Self-study of class topics	26
Prepararation for an exam/credit	30
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Mathematical Analysis 2

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.12PM.00248.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - mathematics

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 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	knows the basic concepts of differential and difference equations and basic methods of solving them	EAC_K1_W1
PEU_W02	knows the definitions and basic properties of curvilinear and surface integrals, and their applications	EAC_K1_W1
PEU_W03	knows the basic differential operators for scalar and vector relating to skills a student	EAC_K1_W1
In terms of skills		
PEU_U01	is able to derive and solve simple differential equation by different methods	EAC_K1_U1
PEU_U02	can calculate line and surface integrals, oriented and non-oriented and knows how to apply them in engineering problems	EAC_K1_U1

PEU_U03	knows how to apply differential operators for vector fields in engineering calculus	EAC_K1_U1

Program content ensuring learning outcomes

Understanding the basic properties of ordinary differential equations and methods of solving them.
Understanding the basic properties of differential equations.
Understanding the basic concepts of functions of several variables (including multiple integrals and differential operators).

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	50
Prepararation for an exam/credit	11
Credit/Exam	4
Student workload	**Hours** 125

Wrocław University of Science and Technology

Foreign Language 1.1

Educational subject description sheet

Basic information

Field of study
lektoraty

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
PWRSJOS.86JO.01761.25

Lecture languages
English

Mandatoriness
Elective

Block
Foreign languages

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

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

Electronic Components

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.14PK.01905.25

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, 2 ECTS, Exam • Classes: 15 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	Describes principles of operation of basic electronic components.	EAC_K1_W4
PEU_W02	Describes structure, characteristics and applications of basic electronic components.	EAC_K1_W4
In terms of skills		
PEU_U01	Calculates parameters of selected electronic components and their circuits.	EAC_K1_U4
PEU_U02	Simulates and analyzes the behavior of selected electronic components and their circuits.	EAC_K1_U4

Program content ensuring learning outcomes

The scope of the course is to acquire knowledge of the principles of operation of electronic device components, as well as a description of the characteristics and applications of basic electronic components.
As part of the course, students will acquire the skills to calculate parameters, simulate and analyse the operation of selected electronic components and their circuits.
As part of the subject, students will acquire the skills to use the appropriate methods, techniques and tools necessary to design simple electrical devices in accordance with the given specification.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	15
Laboratory	15
Preparaton for classes	30
Self-study of class topics	26
Preparation of a report/summary/presentation/paper	30
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Electronics 2

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.14PK.01906.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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 • Classes: 15 h, 1 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 the basic concepts of AC circuit analysis methods: illustrates the essence of the Laplace transform, explains the physical sense of the frequency characteristics of a circuit, knows how to write a periodic function in the form of a Fourier series, defines the concept of two-port networks, explains the phenomena occurring in transmission lines. Describes and lists basic logic circuits.	EAC_K1_W4
In terms of skills		
PEU_U01	Analyzes AC electrical circuits at arbitrary excitations. Uses Fourier series to determine the discrete spectrum of a signal. Determines the frequency characteristics of circuits. Performs matrix description of two-port networks. Designs simple logic circuits.	EAC_K1_U4

Program content ensuring learning outcomes

The program content includes basic knowledge of methods of analysis of electrical and electronic circuits. They include knowledge of operator calculus, operator transmittance, Fourier series, quadrature, transmission lines, fundamentals of logic circuits. As a result of the course, students will acquire the ability to analyze the phenomena occurring in DC and AC electrical circuits.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	15
Laboratory	30
Self-study of class topics	10
Preparaton for classes	15
Preparation of a report/summary/presentation/paper	15
Student workload	**Hours** 100

Wrocław University of Science and Technology

Electronic Technology

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.14PK.01907.25

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, 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	The student explains the principles of design and documentation of mechanical assemblies and justifies the choice of technology for manufacturing a mechanical assembly	EAC_K1_W4
PEU_W02	The student describes the principles for the design of electronic assemblies, selects technologies for the fabrication of electronic assemblies and describes the principles for testing electronic assemblies	EAC_K1_W4
In terms of skills		
PEU_U01	The student uses computer tools to support the design of mechanical and electronic assemblies	EAC_K1_U4
PEU_U02	The student adapts the appropriate manufacturing technology to the component to be designed and uses the information provided in the technical notes in the process of designing the equipment	EAC_K1_U4

Program content ensuring learning outcomes

The course shows the stages in the construction of electronic devices. In the first phase, the student is introduced to the main issues of construction materials and how they can be processed. This is followed by an introduction to the basic steps in the construction of an electronic component, such as the selection of components and electronic parts, the preparation of the schematic diagram and printed circuit board, the design of the housing and wiring, and the analysis of heat flow inside and outside the device. In the final part, students learn how to correctly perform device tests and how to prepare devices for production.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Self-study of class topics	25
Conducting literature research	10
Preparaton for classes	20
Preparation of a report/summary/presentation/paper	10
Student workload	**Hours** 125

Wrocław University of Science and Technology

Scientific and Engineering Programming

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.14PK.01908.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 3 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	Student identifies the basif engineer's and scientist's programming tools, recognizes the role of tool selection, describes the basic concepts and terminology of information technologies	EAC_K1_W3
PEU_W02	Student identifies the role of the system/experiment specification and implementation phase and the methods for visualizing and analyzing the results	EAC_K1_W3
PEU_W03	Student recognizes the MATLAB environment and programming language	EAC_K1_W3
PEU_W04	Student recognizes the Mathematica environment and programming language	EAC_K1_W3
In terms of skills		
PEU_U01	Student uses the MATLAB environment	EAC_K1_U3

PEU_U02	Student uses the Mathematica environment	EAC_K1_U3
PEU_U03	Student creates models and simulations of the behavior of dynamic systems,uses basic symbolic calculations	EAC_K1_U3
PEU_U04	Student prepares reports on the results of work using text editors, spreadsheets, and multimedia presentations.	EAC_K1_U3

Program content ensuring learning outcomes

Knowledge on the programming tools and environments uttilised in the work of engineers and scientists, their application to symbolic calculations and numerical simulations, and explanation of the issues and principles of procedure when preparing a simulation experiment and its implementation in programming environments.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	33
Self-study of class topics	30
Prepararation for an exam/credit	2
Student workload	**Hours** 125

Wrocław University of Science and Technology

Python

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.14PK.01909.25

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, 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	The student characterizes the basic issues in Python programming and identifies and describes popular protocols for communicating with external devices.	EAC_K1_W3
In terms of skills		
PEU_U01	The student uses information technology, develops object-oriented multithreaded, graphical and mobile programs.	EAC_K1_U3

Program content ensuring learning outcomes

The course covers the basics of programming, including variables, data structures, functions and object-oriented programming. Knowledge is imparted on file processing, working with data in JSON and XML formats, using libraries, and handling databases and web services. In addition, practical applications of the language, such as communicating with measuring devices and smart home systems, are demonstrated.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Laboratory	15
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

Math for Electronics

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.14PK.01910.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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 3	• Lecture: 30 h, 2 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	Uses basic concepts and methods of probability calculation and applies basic methods of probability calculation to solve theoretical and practical problems in various fields of science and technology	EAC_K1_W1
PEU_W02	Describes the tasks of statistical hypothesis testing and basic tests on parameters of distributions and selected non-parametric tests.	EAC_K1_W1
In terms of skills		
PEU_U01	Applies basic methods of calculus of probability to solve theoretical and practical problems in engineering applications,	EAC_K1_U1
PEU_U02	Selects and applies basic statistical tests and applies and selects estimation methods for simple statistical models in engineering applications	EAC_K1_U1

Program content ensuring learning outcomes

The course allows you to learn the basic concepts and methods of probability calculation - learning about classical probabilistic distributions, their properties and applications in practical problems in various fields of science and technology. In addition, the presented content will enable students to learn the basic concepts and methods of mathematical statistics calculation in practical problems in various fields of engineering applications

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Preparaton for classes	25
Prepararation for an exam/credit	15
Student workload	**Hours** 100

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 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

Sensors

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.18PK.01911.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 4	• Lecture: 15 h, 1 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	The student defines the basic properties of sensors.	EAC_K1_W4
PEU_W02	The student characterizes the applications of sensors and interfaces in the measurement of physical quantities.	EAC_K1_W4
In terms of skills		
PEU_U01	The student designs a system to acquire data from a selected sensor.	EAC_K1_U4
PEU_U02	The student develops a data acquisition system from a selected sensor.	EAC_K1_U4

Program content ensuring learning outcomes

The curriculum focuses on a comprehensive understanding of sensors and their applications in measurement systems. It includes a detailed discussion of the operating principles of various types of sensors, such as temperature, pressure, light, and motion sensors, with an emphasis on their technical parameters, including accuracy, sensitivity, and measurement range. Participants will gain practical skills in determining and calibrating sensor characteristics as well as analyzing measurement signals. An essential part of the program is the design and development of applications for data acquisition, processing, and visualization from sensors, utilizing modern programming languages and environments that support measurement engineering.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Preparaton for classes	5
Preparation of a project	5
Prepararation for an exam/credit	10
Student workload	**Hours** 50

Wrocław University of Science and Technology

Electronic Circuits

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.18PK.01912.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 4 ECTS, Exam • Laboratory: 30 h, 2 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	The student describes the structure and principle of operation of basic electronic circuits; The student describes the basic techniques of analysis and design of electronic circuits (including computer-aided design techniques); The student characterizes the development trends of analog electronic circuits, including integrated circuits;	EAC_K1_W4
In terms of skills		
PEU_U01	The student designs, according to a given specification and using appropriate methods, techniques and tools (including computer simulations), an elementary electronic circuit.	EAC_K1_U4

PEU_U02	The student constructs a simple electronic circuit, puts it into operation, measures its basic parameters and prepares the results of the experiment in the form of a report.	EAC_K1_U4

Program content ensuring learning outcomes

To gain knowledge of the construction, principles of operation and properties of basic electronic circuits and development trends in this field.
To acquire the ability to design simple electronic circuits.
To become familiar with SPICE-type computer-aided design and simulation tools.
To gain the ability to assemble and commission simple electronic circuits.
To acquire the ability to carry out measurements of circuit parameters using a universal meter, a digital oscilloscope and a function generator.
To perfect the ability to draw up a description of the conducted experiments in a clear form.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Project	30
Preparaton for classes	28
Preparation of a project	30
Preparation of a report/summary/presentation/paper	30
Prepararation for an exam/credit	18
Credit/Exam	4
Student workload	**Hours** 200

Wrocław University of Science and Technology

Software Engineering

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.18PK.00288.25

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: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Compares various programming paradigms	EAC_K1_W3
PEU_W02	Distinguishes various types and levels of testing	EAC_K1_W3
PEU_W03	Lists important elements of commercial development cycle	EAC_K1_W3
In terms of skills		
PEU_U01	Plans initial architecture and flow of the application	EAC_K1_U3
PEU_U02	Implements bigger and more complex client-server application using parallelism and networking	EAC_K1_U3
PEU_U03	Uses GIT tool in order to store and track incremental code production	EAC_K1_U3
PEU_U04	Tests the app using CI approach and tool	EAC_K1_U3

Program content ensuring learning outcomes

In the course students get knowledge and practise the whole cycle of implementing software in commercial approach. Students get experience with various programming paradigms to know they good and weak points and be able to choose the paradigm depending on the problem. Students also get knowledge end experience with more advanced API e.g. networking API to communicate between processes and multitasking API for parallel programming. Beside that, the goal of the course is to focus not only just on programming part but to get experience with all the stuff around like using code repository, continous integration, various test types and test levels. The final goal of the course is to show students how the real-world, commercial development looks like.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Self-study of class topics	15
Prepararation for an exam/credit	5
Preparaton for classes	20
Student workload	**Hours** 100

Wrocław University of Science and Technology

Fundamentals of Telecommunications

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.18PK.01913.25

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: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student is able to name the basic methods of data transmission and explain how they work.	EAC_K1_W6
In terms of skills		
PEU_U01	The student is able to list and properly select the basic methods of data transmission.	EAC_K1_U6
PEU_U02	Student is aware of the importance of systematic work on understanding the subject matter	EAC_K1_U6
PEU_U03	The student is able to work independently and/or collaborate with a team.	EAC_K1_U6

Program content ensuring learning outcomes

Acquainting with the basic methods of data transmission.
Gaining basic knowledge in the field of analog and digital modulation and fiber optic transmission.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	25
Preparation of a report/summary/presentation/paper	5
Conducting literature research	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Introduction to Logic and Microcontrollers

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.18PK.01914.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 4 ECTS, Exam • Classes: 15 h, 1 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	The student explains the principles of microprocessor operation and describes the main elements of microprocessor architecture	EAC_K1_W7
PEU_W02	The student explains the principles of design and optimisation of logic circuits	EAC_K1_W7
In terms of skills		
PEU_U01	The student programs microprocessors in machine language and high-level languages using its functional blocks	EAC_K1_U7
PEU_U02	Students will design and use combinational and sequential logic circuits	EAC_K1_U7

Program content ensuring learning outcomes

In the course, students learn basic knowledge of the operation, design and optimisation of logic circuits. They learn about the design of basic combinational and sequential circuits as well as the actual design of TTL and CMOS logic circuits. In the next phase of the course, the idea of programmable logic circuits and hardware description and verification languages is introduced. In the final phase, students are introduced to the basic knowledge of microprocessor construction and learn how to program and test them.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	15
Laboratory	45
Preparaton for classes	28
Preparation of a report/summary/presentation/paper	30
Prepararation for an exam/credit	28
Self-study of class topics	20
Credit/Exam	4
Student workload	**Hours** 200

Wrocław University of Science and Technology

Introduction to Automation

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.18PK.01915.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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: 30 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	Defines the basic properties of static and dynamic, linear and nonlinear systems, mathematical models of control objects, identification methods and computer simulation	EAC_K1_W5
PEU_W02	Describes the basic structures of control systems and linear regulators, sensors and actuators, is able to select regulators and their settings	EAC_K1_W5
In terms of skills		
PEU_U01	Plans and conducts an experiment to determine the dynamics control object	EAC_K1_U5
PEU_U02	Performs simulations of linear dynamic systems and automatic control systems in MATLAB/Simulink environment	EAC_K1_U5

Program content ensuring learning outcomes

1. Basic concepts of automation and robotics
2. Basic structures of control loops
3. Dynamical systems and their properties used in automation
4. Basic concepts of control theory
5. PID controllers
6. Tuning PID controllers
7. SCADA systems
8. Actuators
9. Sensors
10. Signal converters
11. Communication standarts in automation
12. PLC controllers

Calculation of ECTS points

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

Wrocław University of Science and Technology

Introduction to Robotics

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.18PK.01916.25

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 • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Classifies robots due to various criteria and presents ways to model robots and their environment.	EAC_K1_W5
PEU_W02	Defines forward and inverse tasks of robot kinematics and dynamics and explains the theory of algorithms for their solution.	EAC_K1_W5
PEU_W03	Characterizes basic sensors used in robotics, characterizes and illustrates the basic methods of mobile robot motion planning.	EAC_K1_W5
In terms of skills		
PEU_U01	Analyzes and simulates basic robotic tasks and their components.	EAC_K1_U5
PEU_U02	Calculates kinematic and dynamic tasks for manipulators and mobile robots.	EAC_K1_U5

Program content ensuring learning outcomes

The purpose of the course in terms of knowledge is for students to learn robotic terminology and basic robotics tasks, to learn about sensorics and modeling of robots and their environment. In terms of skills: to master techniques for solving selected kinematic and dynamic tasks.

Calculation of ECTS points

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

Wrocław University of Science and Technology

Computer Networks

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.110TI.01917.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Information Technologies

Semester	Activities, hours, ECTS and examination
Semester 5	• 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	Student explains and describes basic information in the field of computer networks including applications and role in the modern world.	EAC_K1_W9
PEU_W02	Student explains and describes basic standards of computer networks including cables, technologies and protocols. Explains and describes basic information related to design and configuration of computer networks.	EAC_K1_W9
In terms of skills		
PEU_U01	Student constructs and designs a configuration of a simple computer network including design of IP addressing, and uses diagnostic tools.	EAC_K1_U9
PEU_U02	Student uses a network protocol analyzer. Configurse and manages popular network services.	EAC_K1_U9

Program content ensuring learning outcomes

Computer Networks course provides students with applied skills and practical knowledge in the fundamentals of computer networking, including layered models, network protocols and network devices. After completing the course, every student will have a working knowledge of routing, switching, basic network applications and key protocols, as well as skills in construction, design, and configuration of computer networks, including IP addressing, analysis of network traffic and experience in using network diagnostic tools.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	20
Self-study of class topics	10
Prepararation for an exam/credit	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Microcontrollers

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.110PK.01918.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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, 2 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	The student explains the design principles of basic microprocessor systems. He/she selects a microcontroller with respect to the required performance and offered peripheral circuits for a given application.	EAC_K1_W7
PEU_W02	The student explains the principles of designing and running code that performs specific tasks on a selected hardware platform. Describes ways of integrating a microcontroller with external digital and analogue circuits.	EAC_K1_W7
In terms of skills		

PEU_U01	The student selects and effectively uses a development environment for RISC-type microcontrollers. Prepares, develops, verifies and implements test and application software for microcontrollers	EAC_K1_U7
PEU_U02	The student finds information on the parameters and characteristics of microcontrollers	EAC_K1_U7

Program content ensuring learning outcomes

During the course, the student will be introduced to the architecture and main components of single-chip microcontrollers and the methods of programming them efficiently. During the course emphasis will be placed on the structures and coding methods of 8- and 16-bit cores. The student will learn how to handle the basic peripheral blocks implemented in microcontroller circuits, such as timers, transfer controllers, power controllers, communication circuits or analogue-digital and digital-analogue processing circuits. Various methods of achieving multitasking, both hardware and software, will also be demonstrated.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Project	15
Preparaton for classes	18
Prepararation for an exam/credit	8
Credit/Exam	4
Preparation of a project	20
Student workload	**Hours** 125

Wrocław University of Science and Technology

Advanced Topics in Robotics

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.110PK.01920.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 3 ECTS, Graded credit • Project: 30 h, 3 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The terminology used in computer systems, contains basic assumptions and products is explained. The student distinguishes popular methods and algorithms and can select an appropriate one for a given goal. The student can indicate the directions of research on modern robots, with current results, indicating their application.	EAC_K1_W5
In terms of skills		
PEU_U01	The student develops a complete robotic system: analyzes requirements, designs and constructs the device, tests it and analyzes test results.	EAC_K1_U5
PEU_U02	The student works in a group to implement the project, leads a discussion on the solutions proposed by the group, presenting arguments evaluating the proposed solutions.	EAC_K1_U5

Program content ensuring learning outcomes

The program is designed to equip students with foundational knowledge, hands-on experience, and an understanding of current advancements in robotics. The content includes lectures, projects and seminars that collectively address key theoretical and practical aspects of robotics systems, sensors, control mechanisms, and design. By the end of the course, students will have a solid grasp of key terminology, an understanding of the main topics in current robotics research, and familiarity with recent advancements in the field. They will also gain practical experience in designing and constructing robotic systems, presenting their findings and insights through seminars to strengthen their communication and technical reporting skills.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Project	30
Seminar	15
Self-study of class topics	25
Preparation of a report/summary/presentation/paper	30
Preparation of a project	45
Student workload	**Hours** 175

Wrocław University of Science and Technology

Digital Signal Processing

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.110PK.00287.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 5	• Lecture: 30 h, 3 ECTS, Graded credit • Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Describes methods of signal representation, sampling, and quantization, identifies the basic problems in the theory of digital signal processing, filter structures, implementation principles, DSP processor architecture, code generation techniques, and debugging methods.	EAC_K1_W7
In terms of skills		
PEU_U01	Performs basic signal analysis in time and frequency domains using digital filters and knows how to use development tools, create programs for DSP processors, considering the specifics of languages (C, ASM, Python) and hardware features of the processor.	EAC_K1_U7

Program content ensuring learning outcomes

The course content aims to equip students with knowledge related to signal representation, sampling and quantization issues, the fundamentals of digital signal processing theory, as well as the design and implementation of digital filters. The architecture of DSP processors and effective methods for generating program code will also be discussed, alongside tools for debugging. Students will acquire practical skills in signal analysis and developing programs for basic signal processing algorithms, considering the specifics of programming languages (ASM, C, Python) and hardware features of DSP processors. This comprehensive approach to both theoretical knowledge and practical skills will enable students to apply their newfound understanding to real-world signal processing projects.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	45
Self-study of class topics	20
Preparation of a report/summary/presentation/paper	60
Prepararation for an exam/credit	20
Student workload	**Hours** 175

Wrocław University of Science and Technology

Artificial Intelligence and Computer Vision

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.110PK.01921.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 3 ECTS, Graded credit • 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	Elaborates about the basic methods and algorithms of artificial intelligence.	EAC_K1_W10
PEU_W02	Elaborates about the basic methods and algorithms of computer vision	EAC_K1_W10
In terms of skills		
PEU_U01	Solves basic problems using methods and algorithms of computer vision.	EAC_K1_U10

Program content ensuring learning outcomes

Program content includes basic knowledge in the following aspects: knowledge representation, inferencing, searching, logic

and probability in artificial intelligence scope.
They do include knowledge about image acquisition and filtering, edge detection, recognition of shapes and objects on image.
They increase knowledge about development of artificial intelligence methods and algorithms applications for solving given problems, as well as getting knowledge about development of image processing and computer vision applications.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Project	15
Self-study of class topics	30
Preparation of a project	45
Preparation of a report/summary/presentation/paper	15
Prepararation for an exam/credit	10
Student workload	**Hours** 175

Wrocław University of Science and Technology

Optoelectronics

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.110PK.01922.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

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

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knows the basic mechanisms regarding the generation, detection, and propagation of light, in particular: the laws concerning the nature of light, the physical aspects of the operation of selected light sources, detectors and displays, the principles of transmitting and encoding information using light, as well as techniques for presenting three-dimensional images.	EAC_K1_W2
In terms of skills		
PEU_U01	Analyses datasheet parameters of several optoelectronic components, chooses the appropriate working conditions, and uses them in an example application.	EAC_K1_U4
PEU_U02	Presents to the audience data and information of a scientific nature as well as to formulate/justify opinions in a public discussion.	EAC_K1_U11

Program content ensuring learning outcomes

Optoelectronics is a training course that helps students gain an understanding of the fundamental laws of optoelectronics, properties of optoelectronic materials, and rules for the use of light to carry information. Practical tasks are aimed at gaining an experience of the operation of a wide range of optoelectronic devices used in communications, sensing, and information technology basing on project-based learning. Moreover, the students achieve the ability to search for information about the selected scientific and technical challenges and present the information of a scientific content.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Project	30
Seminar	15
Self-study of class topics	20
Prepararation for an exam/credit	20
Preparation of a project	20
Preparation of a report/summary/presentation/paper	15
Preparaton for classes	15
Conducting literature research	10
Student workload	**Hours** 175

Wrocław University of Science and Technology

Wireless Systems

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.110PK.01923.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 3 ECTS, Graded credit • 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	The student characterises the types and applications of wireless systems, as well as the frequency bands used, network architecture and functions of individual components, radio interfaces, channel structure and popular transmission techniques, capacity and spectral efficiency of wireless systems. The student describes basic parameters related to the radio link of wireless systems	EAC_K1_W6
PEU_W02	The student describes data transmission techniques in mobile systems and the current state of knowledge and development trends in the field of mobile and wireless communication systems	EAC_K1_W6
In terms of skills		

PEU_U01	The student tests the operation, features, performance and functionality of mobile communications and wireless systems. The student uses a spectrum analyser and other measurement tools used to test the performance of mobile communications and wireless systems	EAC_K1_U6
PEU_U02	Student uses selected mobile and wireless network equipment	EAC_K1_U6

Program content ensuring learning outcomes

C1. Learning methods of wireless communication between electronic modules
C2. Learning about different wireless communication standards, networks' architecture and network equipment.
C3. Gaining design skills of designing electronic module for wireless data exchange
C4. Obtaining design skills of choosing the proper network standard, network architecture and network equipement for required usage

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Project	15
Preparaton for classes	20
Preparation of a report/summary/presentation/paper	10
Preparation of a project	20
Conducting literature research	20
Self-study of class topics	15
Prepararation for an exam/credit	15
Student workload	**Hours** 175

Wrocław University of Science and Technology

Selected Topics in Deep Learning

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.120PK.01924.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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: 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	Describes selected artificial representation schemes and associated algorithms	EAC_K1_W10
In terms of skills		
PEU_U01	Plans and realises a data processing pipeline for solving selected problem in context of deep learning and artificial intelligence.	EAC_K1_U10

Program content ensuring learning outcomes

In the context of the course student gains knowledge in scope of deep learning algorithms. Knows basic techniques used in supervised learning, reinforcement learning and unsupervised learning. Student is able to chose right tooling for solving selected problems of artificial intelligence.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Laboratory	30
Self-study of class topics	15
Preparaton for classes	25
Student workload	**Hours** 100

Wrocław University of Science and Technology

Team and Pre-Engineering Project

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.120PK.01925.25

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Project: 45 h, 5 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of social competences		
PEU_K01	The student is open to working with the team, demonstrates awareness of his/her role in the project, and cares that assigned tasks are completed on time.	EAC_K1_K4

Program content ensuring learning outcomes

Acquire the ability to perform assigned engineering tasks when executing a complex engineering assignment. Gain experience in teamwork, including planning and scheduling skills, intra-team communication, acting as a team member or leader, the opportunity to demonstrate creativity, openness to innovative approaches to achieving a goal, and a team success orientation.

Calculation of ECTS points

Activity form	Activity hours
Project	45
Conducting literature research	10
Preparation of a report/summary/presentation/paper	15
Preparation of a project	45
Self-study of class topics	10
Student workload	**Hours** 125

Wrocław University of Science and Technology

Control Systems Engineering

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.120PK.01927.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Explains the general structure and role of an industrial network in a manufacturing enterprise, its hardware base, protocols and security mechanisms used	EAC_K1_W5
PEU_W02	Explains the architecture and functionalities of building automation systems and automation mechanisms used in intelligent buildings (e.g. BMS, IBMS)	EAC_K1_W5
In terms of skills		
PEU_U01	Configures controller for use in an industrial network with the use of proper protocols	EAC_K1_U5
PEU_U02	Chooses the right industrial automation solutions for specific engineering and manufacturing requirements	EAC_K1_U5

Program content ensuring learning outcomes

The scope of the course is to gain knowledge about the structure and equipment base of industrial networks in automation systems and the use of networks during the designing and operation of automation systems. The students will gain knowledge and skills in matching, configuring and operating selected Fieldbus serial communication networks and Ethernet-based networks. The students will learn about redundancy in automation systems, safety in automation systems, and how to match, configure and operate selected distributed automation systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	45
Preparaton for classes	15
Self-study of class topics	26
Prepararation for an exam/credit	15
Preparation of a report/summary/presentation/paper	15
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Embedded Systems

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.120PK.01928.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student describes the design principles of digital programmable circuits. The student selects an FPGA in terms of required performance and offered peripherals for a given application.	EAC_K1_W7
PEU_W02	The student explains the principles of construction and applications of embedded systems. Describes multicore processors and the idea and operation of parallel processing.	EAC_K1_W7
In terms of skills		
PEU_U01	The student uses information provided in technical notes in the design process of embedded systems. The student uses computer tools to support the design and testing of software for a selected hardware platform	EAC_K1_U7

PEU_U02	The student develops software in HDL languages using the building blocks of FPGAs.	EAC_K1_U7

Program content ensuring learning outcomes

During the course, students improve their knowledge and skills in modern single-chip and multi-core microcontrollers. They learn about the use of various intermediate peripheral circuits in particular those required for Internet of Things and Neural Networks or Artificial Intelligence applications. Students are introduced to the idea of parallel processing on multi-core homogeneous and heterogeneous processors. In the final phase of the course, students improve their knowledge and skills in using programmable logic structures in the implementation of signal processing algorithms. They learn about the main structures, parameters and applications, and acquire knowledge of the basics of HVL languages and their use to create a variety of combinational and sequential circuits.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	45
Preparaton for classes	25
Prepararation for an exam/credit	10
Preparation of a report/summary/presentation/paper	10
Self-study of class topics	16
Conducting literature research	10
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Real-Time Operating Systems

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.120PK.01929.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 30 h, 2 ECTS, Exam • Project: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Elaborates on the general design and functions of real-time operating systems.	EAC_K1_W3
In terms of skills		
PEU_U01	Creates real time applications for given real time operating systems.	EAC_K1_U3

Program content ensuring learning outcomes

Program content includes basic knowledge about the structure and functionalities of real-time operating systems. Ase a result of subject realization students will get the practical ability to use a real-time functionalities in RTOS and to program and deploy applications in selected RTOS.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Project	45
Preparation of a project	31
Credit/Exam	4
Self-study of class topics	30
Prepararation for an exam/credit	10
Student workload	**Hours** 150

Wrocław University of Science and Technology

Lasers, Fibers and Applications

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.120PK.01930.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 6	• Lecture: 30 h, 2 ECTS, Exam • Project: 30 h, 3 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Can describe the physical phenomena behind the generation of coherent electromagnetic radiation, classifies types of lasers, lists their parameters and describes their applications	EAC_K1_W2
PEU_W02	Can describe the phenomenon of light propagation in optical fibers, list the types of optical fibers and their basic parameters	EAC_K1_W6
In terms of skills		
PEU_U01	Can carry out an elementary experiment in laser and fiber optics technology, related to the use of basic optical elements and basic diagnostic and measurement equipment.	EAC_K1_U2
PEU_U02	Is able to find the necessary information from the conference materials written in English in optocommunications or optoelectronics	EAC_K1_U11

PEU_U03	Student is able to prepare and to present a talk on chosen subject in English.	EAC_K1_U11

Program content ensuring learning outcomes

The scope of the course is to acquire knowledge of the elementary physics of lasers and the mechanisms occurring in lasers, the basic parameters of lasers, distinguishing different types of lasers and their most popular applications. In addition, the program of the subject includes topics from the field of fiber optics technology: mechanisms of light propagation in optical fibers, types of optical fibers, their parameters, and the construction and applications of optical amplifiers. As a result of the course, students will gain skills in conducting basic experiments in the field of laser and fiber optics technology, use of measurement apparatus, measurement of parameters of lasers and optical fibers, and the ability to independently interpret and analyze the obtained measurement results.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Project	30
Seminar	15
Prepararation for an exam/credit	26
Conducting literature research	15
Preparaton for classes	15
Preparation of a report/summary/presentation/paper	15
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Cybersecurity

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.120PK.03902.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 30 h, 3 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Describers the basic definitions of cyber security	EAC_K1_W6
PEU_W02	Describes techniques responsible for maintaining the security of systems	EAC_K1_W6
In terms of skills		
PEU_U01	Can analyse systems from a security perspective	EAC_K1_U6
PEU_U02	Uses cryptographic methods for secure systems	EAC_K1_U6

Program content ensuring learning outcomes

This course covers a comprehensive range of topics to equip learners with the knowledge and skills to address current and

emerging threats. It begins with an introduction to the cyber security landscape, covering foundational concepts, the dynamics of cyber warfare, and the race between hackers and defenders. The curriculum explores types of cyber attacks—including malware, ransomware, and social engineering—and their impact on data privacy. Students learn to secure web applications, model threats, and analyze network and internet vulnerabilities, developing an understanding of policies, regulations, and organizational protection. Programming in cybersecurity introduces key defense mechanisms, exploitation techniques, and system security measures. Finally, the course delves into cryptology, covering encryption fundamentals and advanced cryptographic engineering to ensure data integrity and confidentiality.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Seminar	15
Self-study of class topics	26
Preparaton for classes	30
Preparation of a report/summary/presentation/paper	15
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

Electroacoustics

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.120PK.01932.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 45 h, 4 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student describes mechanical vibrations and acoustic waves and the quantities that characterize sound, explains the physiology and psychology of hearing, and speech, and describes the properties of speech, transmission of sound signals, electroacoustic transducers, and basic acoustic systems.	EAC_K1_W4
PEU_W02	The student describes ultrasonic waves and their properties and explains the principle of operation, basic parameters, and characteristics of ultrasonic transducers.	EAC_K1_W4
In terms of skills		
PEU_U01	The student makes basic acoustic and ultrasonic measurements, examines the speech signal, and analyzes and interprets the results of the measurements.	EAC_K1_U4

PEU_U02	The student makes and analyzes measurements of the parameters of ultrasonic transducers.	EAC_K1_U4

Program content ensuring learning outcomes

The scope of the course (lecture) is for students to acquire knowledge of mechanical vibrations, acoustic and ultrasonic waves, quantities that characterize sound and ultrasound, physiology and psychology of hearing, speech and speech properties, transmission of sound signals and electroacoustic and ultrasonic transducers, basic acoustic systems.
The scope of the course (laboratory) is for students to acquire the ability to prepare and perform basic acoustic and ultrasonic measurements, speech signal characterization, and analysis and interpretation of measurement results.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	45
Self-study of class topics	20
Prepararation for an exam/credit	10
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	31
Credit/Exam	4
Student workload	**Hours** 150

Wrocław University of Science and Technology

EdgeAI

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.120PK.01940.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 15 h, 1 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	The student defines the hardware requirements for creating a properly functioning neural network	EAC_K1_W10
PEU_W02	The student justifies the choice of the optimal artificial intelligence structure for the assumed application	EAC_K1_W10
In terms of skills		
PEU_U01	The student searches for and interprets technical information on new developments in artificial in embedded systems	EAC_K1_U10
PEU_U02	The student uses the selected embedded system and the selected AI algorithm to solve a practical problem	EAC_K1_U10

Program content ensuring learning outcomes

C1 - Gain knowledge of the basics of neural network design and learning.
C2 - To gain knowledge of how to implement artificial intelligence in microcontroller systems.
C3 - To achieve the ability to create and run neural networks on single chip microcontrollers

Calculation of ECTS points

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

Wrocław University of Science and Technology

Internship

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.140PZ.01767.25

Lecture languages
English

Mandatoriness
Obligatory elective

Block
Internship

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

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Student has the ability to work individually and in teams.	EAC_K1_U8
PEU_U02	Student has the ability to use the acquired knowledge to creatively analyze and solve various engineering problems.	EAC_K1_U8
In terms of social competences		
PEU_K01	Student is aware of the responsibility for his own work, and is open to the exchange of ideas and new challenges.	EAC_K1_K4

Program content ensuring learning outcomes

1. Confrontation of knowledge acquired during the didactic classes covered by the study plan, with the actual requirements set by employers.
2. Gaining industrial experience, getting to know the company's basic technical and technological equipment, including learning about the specifics of the work of higher technical supervision.

3. Becoming familiar with the peculiarities of the professional environment and forming specific professional skills directly related to the internship site.
4. Perfecting the ability to organize own and team work, effective time management, conscientiousness, responsibility for assigned tasks.
5. Professionalisation of professional behavior, observance of professional ethics and respect for technical diversity.

Calculation of ECTS points

Activity form	**Activity hours**
Realizacja praktyki zawodowej	160
Preparation of a report/summary/presentation/paper	15
Student workload	**Hours** 175

Wrocław University of Science and Technology

Final Project

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.140PD.01933.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**Lecture languages** English
Study level first degree engineering	**Mandatoriness** Obligatory elective
Study form full-time studies	**Block** Diploma thesis
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 skills		
PEU_U01	Searches effectively for information in the world literature using publication databases, technical documentation, etc. Integrates and interprets literature materials found	EAC_K1_U8
PEU_U02	Plans and conducts an experiment (laboratory or computerized). Formulates and solves problems using analytical, simulation and experimental methods. Can interpret the obtained results of the experiment	EAC_K1_U8
PEU_U03	Writes a diploma thesis in the form of a dissertation, including a review of the literature, documentation of the research conducted, summary of the results and conclusions	EAC_K1_U8

Program content ensuring learning outcomes

The scope of the course is the completion of a thesis by the student, based on the knowledge acquired during the studies. As

part of the course, the student prepares, under the substantive supervision of the supervisor, a thesis that is of an engineering nature and requires research, calculations, experiments, etc. As part of the course, the student writes a thesis, including his/her own original results and literature review. The Diploma Thesis course organizes and consolidates the skills acquired during the studies and, above all, prepares students to work independently on their own projects, including in the context of conducting scientific research work.

Calculation of ECTS points

Activity form	**Activity hours**
Diploma thesis	30
Preparation of the thesis	210
Conducting empirical studies	60
Student workload	**Hours** 300

Wrocław University of Science and Technology

Diploma Seminar

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.140PK.00315.25

Lecture languages
English

Mandatoriness
Obligatory 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 skills		
PEU_U01	Prepares a multimedia presentation containing the obtained results	EAC_K1_U11
PEU_U02	Discusses original ideas and solutions, critically evaluates scientific and technical solutions, and other solutions related to social competences	EAC_K1_U11

Program content ensuring learning outcomes

Each student participating in the “Diploma Seminar” is required to give four presentations on the progress of his or her engineering thesis in a 10-week semester (10 terms of 3 class hours each). At the first class, each seminar participant presents a short approximately 10-minute “Zero Presentation”, including: the title of the engineering thesis, the thesis supervisor, and on 2-3 slides the essence of the engineering thesis, its objectives and possible thesis, as well as the basic literature for the thesis. It also shows the progress (in percentages), if already advanced in the work. After that, the semester is divided into three 3-terminal rounds (3 terms each round), where each student presents ongoing progress with the engineering thesis in approximately 20-25 minute presentations. Assuming a seminar group of 15 students, on average

there should be 5 presentations per term (135 minutes) that also includes a post-presentation discussion each time.
The content, the distribution of the material presented and the manner of presentation are at the discretion of the student.
Each presentation in the form of a set of presented slides is sent by e-mail to the seminar leader, who documents the progress of the engineering work.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparation of a report/summary/presentation/paper	45
Student workload	**Hours** 75

Wrocław University of Science and Technology

Electrotechnics

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.140PK.01935.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• Lecture: 30 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	The student explains the effects of electric current on the human body, lists electric shock protection measures and classifies them. Explains the criteria for the effectiveness of protection in low-voltage installations.	EAC_K1_W4
In terms of skills		
PEU_U01	The student selects appropriate meters and makes tests of low-voltage electrical installations. Analyzes and evaluates test results and prepares documentation.	EAC_K1_U4

Program content ensuring learning outcomes

Knowing the rules for construction of low-voltage electrical installations.
Getting to know the criteria of effectiveness of protection against installations with an operating voltage up to 1kV.

Knowledge of the principles of the organization of safe operation of electrical equipment and first aid in cases of electric shock.
Acquiring the ability to perform basic research of low-voltage electrical installations.
Perform basic switching operations in power installations and control of operating voltages up to 1kV

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	15
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	20
Student workload	**Hours** 75

Wrocław University of Science and Technology

Medical Electronics

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.140PK.01936.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 2 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Explains the construction and operation of selected diagnostic, life-supporting and therapeutic equipment	EAC_K1_W4
In terms of skills		
PEU_U01	Searches for information on the latest solutions in the design and construction of electronic medical equipment from various foreign language sources, especially specialist literature, analyses it and uses it to prepare a multimedia presentation.	EAC_K1_U11

Program content ensuring learning outcomes

The subject covers basic medical techniques and the construction and principles of operation of electronic medical equipment: diagnostic, life support and therapeutic. As a result of its implementation, students will be able to acquire and present new knowledge in the field of electromedical equipment in the form of a multimedia presentation.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Seminar	15
Preparation of a report/summary/presentation/paper	15
Conducting literature research	5
Prepararation for an exam/credit	10
Student workload	**Hours** 75

Wrocław University of Science and Technology

Electronics for Renewable Energy Sources

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.140PK.01937.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 30 h, 2 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Describes and characterizes traditional and renewable energy sources, electronic systems used in renewable energy systems, including electric energy converters, inverters, protective circuits, charge controllers, diagnostic systems, maximum power point tracking algorithms, sun-tracking systems, energy storage methods, circuit solutions applied in low-energy buildings, and electric and hybrid vehicles. Presents current trends in renewable energy systems.	EAC_K1_W4
In terms of skills		
PEU_U01	Searches for and interprets technical information on new solutions in renewable energy electronics, prepares and presents information on renewable energy sources, analyzes the advantages and disadvantages of electric energy converters, selects maximum power point tracking, and sun-tracking algorithms.	EAC_K1_U4

Program content ensuring learning outcomes

The course aims to provide knowledge of renewable energy technology, including the topology of photovoltaic systems and wind power plants, construction of converters and voltage inverters, charge controllers, protective circuits, and energy storage systems. Through this course, students will acquire skills in searching for and interpreting technical information on new solutions in renewable energy electronics, preparing and presenting information on renewable energy sources, applied electrical energy converters, and methods of maximizing energy production by renewable sources.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Seminar	15
Self-study of class topics	10
Prepararation for an exam/credit	5
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	5
Student workload	**Hours** 75

Wrocław University of Science and Technology

Machine Learning

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.140PK.01938.25

Lecture languages
English

Mandatoriness
Elective

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 7	• 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	Provides an introduction to unsupervised and supervised learning and explains the differences between the two types.	EAC_K1_W10
PEU_W02	Uses machine learning methods in pattern recognition, signal and image processing, data mining, and spectral analysis	EAC_K1_W10
In terms of skills		
PEU_U01	Formulates a machine learning problem, tests its properties and selects the right algorithm for solving it	EAC_K1_U10
PEU_U02	Implements and tests machine learning algorithms in a computational environment	EAC_K1_U10

Program content ensuring learning outcomes

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Project	30
Prepararation for an exam/credit	10
Preparation of a project	10
Preparation of a report/summary/presentation/paper	10
Student workload	**Hours** 75

Wrocław University of Science and Technology

Ultrasonic Technology

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.140PK.01939.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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	• Lecture: 15 h, 1 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	Names, describes and distinguishes basic concepts and theoretical issues related to ultrasound technology.	EAC_K1_W2
PEU_W02	Introduces the principles of ultrasound sources and the creation of equivalent circuits designed to work in different media.	EAC_K1_W2
In terms of skills		
PEU_U01	Makes ultrasonic measurements of basic physical parameters.	EAC_K1_U2
PEU_U02	Operates ultrasonic equipment designed for active and passive ultrasound applications.	EAC_K1_U2
PEU_U03	Develops a test report / measurement protocol.	EAC_K1_U2

Program content ensuring learning outcomes

The scope of the lecture is for students to acquire knowledge of the physical phenomena and processes occurring in ultrasonic technology, as well as the principles of operation and the creation of equivalent diagrams of ultrasonic transducers for operation in various media.
In terms of laboratory, it is to acquire students' skills concerning the determination of basic physical quantities in the field of ultrasonics and the ability to perform ultrasonic measurements of basic physical parameters and to operate ultrasonic equipment designed for non-destructive testing.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Self-study of class topics	10
Prepararation for an exam/credit	5
Preparaton for classes	5
Preparation of a report/summary/presentation/paper	10
Student workload	**Hours** 75

Wrocław University of Science and Technology

Copyright

Educational subject description sheet

Basic information

Field of study Electronic and Computer Engineering	**Education cycle** 2025/2026
Speciality -	**Subject code** W12NEACS.140HS.01941.25
Organizational unit Faculty of Electronics, Photonics and Microsystems	**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 7	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of social competences		
PEU_K01	Describes the main copyright regulations	EAC_K1_K2
PEU_K02	Correctly identifies the need for copyright protection	EAC_K1_K2

Program content ensuring learning outcomes

The course aims at providing students with basic knowledge concerning the field of copyright and related rights

Calculation of ECTS points

Activity form	Activity hours
Lecture	30

Conducting literature research	20
Student workload	**Hours** 50

Wrocław University of Science and Technology

Entrepreneurship

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.140HS.01942.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

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

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Discusses the principles of creating individual entrepreneurship	EAC_K1_W8
In terms of social competences		
PEU_K01	Identifies the legal, economic, and social implications of engineering activities in the field of entrepreneurship	EAC_K1_K3

Program content ensuring learning outcomes

The program content includes basic 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	30
Conducting literature research	20
Student workload	**Hours** 50

Wrocław University of Science and Technology

Social Development Philosophy

Educational subject description sheet

Basic information

Field of study
Electronic and Computer Engineering

Speciality
-

Organizational unit
Faculty of Electronics, Photonics and Microsystems

Study level
first degree engineering

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code
W12NEACS.140HS.05869.25

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

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

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of social competences		
PEU_K01	After completing the course, the student identifies social issues, respects human rights, and takes initiative in actions for social justice.	EAC_K1_K2

Program content ensuring learning outcomes

The aim of the course is for students to acquire knowledge and skills enabling them to develop competences related to the analysis of an engineer's work in the aspect of social development. The course will also develop basic skills in critical thinking and analysis of the socio-economic and political situation, reading philosophical texts, as well as the ability to argue and debate on topics related to the broad issue of social development. Knowledge from the lecture covers the philosophical foundations of social development, models and theories of development, mechanisms of social change and their consequences, and critical analysis of contemporary social problems.

Calculation of ECTS points

Activity form	Activity hours
Lecture	30
Preparaton for classes	10
Self-study of class topics	5
Prepararation for an exam/credit	5
Student workload	**Hours** 50