



Lodz University
of Technology

Study programme

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

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Basic information

Name of the field of study:	Electronics and Telecommunications
Level of study:	first-cycle programme (inżynier)
Study profile:	general academic
Form of studies:	full-time studies
Duration of studies (number of semesters):	7
The number of ECTS points required to complete studies:	210
Total number of hours of classes:	2657
The number of ECTS points a student obtains as part of classes conducted with the direct participation of academic teachers or other persons conducting classes:	106
Professional title awarded to graduates:	inżynier
ISCED code:	0714
Language of study:	polish

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

Discipline	Percentage share
Automation, electronics and electrical engineering	70%
Technical computing and telecommunications	30%

Learning outcomes (in relation to the PQF)

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
1	1EIT1	Has advanced knowledge and understanding of selected areas of mathematics, including mathematical analysis, linear algebra, statistics, numerical methods and physics, including electromagnetism, which enables them to formulate and solve complex engineering problems typical for electronics and telecommunications, including mathematical modelling of physical phenomena.	P6U_W	P6S_WG
2	1EIT10	Is ready to participate in projects related to electronics and telecommunications, thinking and acting in an entrepreneurial manner, contributing technical knowledge and awareness of non-technical aspects, including social and economic ones, and acquiring new knowledge and skills as needed.	P6U_U, P6U_K	P6S_UO, P6S_UU, P6S_KK, P6S_KO
3	1EIT2	Has structured and theoretically grounded detailed knowledge of the design, properties, parameters and technological processes involved in the manufacture of electronic components, systems and equipment, taking into account the fundamental processes of product life cycle, and is also familiar with development trends in electronics.	P6U_W	P6S_WG, P6S_WK, P6S_WG_inż
4	1EIT3	Knows and understands the architecture, operating principles and design methods of wired and wireless telecommunications systems. Has knowledge of standardisation, data transmission standards, communication protocols and cybersecurity.	P6U_W	P6S_WG
5	1EIT4	Is able to identify, formulate and solve complex problems in the field of electronics and telecommunications. Is able to plan and conduct experiments, including measurements and computer simulations, as well as interpret the results obtained, estimate measurement uncertainty and calculation errors, and diagnose the causes of system malfunctions.	P6U_U	P6S_UW, P6S_UW_inż
6	1EIT5	Is able to formulate design assumptions, prepare technical specifications, and based on them design, modify, or expand complex electronic circuits or telecommunications systems, selecting appropriate methods, components, and technologies. Is able to use computer aided design tools and simulation platforms to verify designs.	P6U_U	P6S_UW, P6S_UW_inż
7	1EIT6	Is able to implement algorithms in microprocessor systems or programmable logic circuits by integrating the hardware and software layers.	P6U_U	P6S_UW, P6S_UW_inż
8	1EIT7	Is able to acquire information and communicate using specialized terminology in the field of electronics and telecommunications, including foreign language at B2 level; is able to present and evaluate different opinions and statements and discuss them.	P6U_U	P6S_UK
9	1EIT8	Is able to function in a team, whose members jointly set goals, plan, and carry out tasks.	P6U_U	P6S_UO

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
10	1EIT9	Is ready to adhere to professional ethics, also due to knowledge of basic concepts and principles of industrial property protection and copyright law. Is ready to perform the professional role of an electronics engineer and understands the principles of creating and developing various forms of entrepreneurship.	P6U_W, P6U_K	P6S_WK, P6S_KO, P6S_KR, P6S_WK_inž

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

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
1	Mathematics I	Fundamentals of mathematical logic, elementary functions, number sequences, differential and integral calculus of functions of one variable, complex numbers, linear algebra, analytic geometry, vector spaces and linear mappings, number and function series in real domain.	x				x					
2	Physics	Energy, work, fields, conservation laws, vibrations and waves, electromagnetic field: description and properties, electromagnetic waves and their properties, elements of wave optics, scattering, polarisation, interference and diffraction, introduction to quantum mechanics, uncertainty principle, Schrödinger equation, atomic structure, energy levels and bands, contemporary methods of studying matter and the structure of the universe, current problems in physics.	x				x					
3	Electrical Circuits	Fundamentals of electrical installations, electric shock protection, protective equipment and conditions for the safe operation of electrical equipment. The effect of electric current on the human body. Basic concepts, laws and theorems in the field of electrical circuit theory. Methods of analysing linear direct current and sinusoidal alternating current systems in a steady state. Resonant circuits. Operational amplifiers and their applications. Basic information on non-linear elements and methods of analysing non-linear circuits. Transient states in first-order circuits. Measurement and simulation verification of basic phenomena in electrical circuits.	x			x	x					
4	Materials Physics	Structure of solids, fundamentals of band theory, electrical conductivity; thermal properties; classification of properties and applications of electrotechnical and electronic materials (conductors, superconductors, semiconductors, dielectrics, magnetics), radiation sources and detectors, nanomaterials.	x				x					
5	University Skills	Preparing students for conscious and effective learning. Familiarising them with basic tools, techniques and strategies that increase the effectiveness of the learning process. Integrating student groups through discussion, cooperation and mutual learning. Presenting the principles of academic culture and the general concept of education in the field of study. Ethics of new technologies.		x						x		
6	Basics of Programming	Programming in the language of choice, elements of language and data structures, graphics programming and peripheral operation using a simple graphics library, programming logic for simple games, modern information technology including issues in digitisation, algorithmisation, artificial intelligence tools, cybersecurity.							x			
7	Engineering Graphics and Documentation	Working with spreadsheets and word processors, data visualization, engineering graphics, 2D drawings, dimensioning, technical documentation, 3D printing.						x		x		
8	English B2 module I	First part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
9	English B2+ module I	First part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
10	German B2 module I	First part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
11	English C1 module I	First part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
12	Mathematics 2	Differential calculus of multivariable functions, ordinary differential equations, Laplace transform, double and triple integrals, line integrals of scalar and vector fields.	x				x					
13	Measurements and Statistics	Measurement of electrical quantities, digital multimeters, digital oscilloscopes, processing of measurement results, error and uncertainty analysis of measurement results, elements of descriptive and mathematical statistics, hypothesis testing, use of spreadsheets.	x				x					
14	Introduction to Electronics	Principles of semiconductor device operations: BJT, JFET, MOSFET transistors, diodes. Principle of operation of selected basic electronic circuits, selection of transistor, selection and importance of reactive components, effect of component tolerances. Power dissipated in a transistor. Analysis, simulation, practical implementation using a contact board and universal board. Circuit testing using multimeters, oscilloscopes, power supplies and signal generators.			x		x	x				
15	Procedural Programming	Data types and their representation in a selected programming language. Dynamic memory allocation. Basic data structures (stack, list). Basic algorithms (sorting, searching). Support tools (debugger, valgrind, gcc boundschecking). Static and dynamic libraries.							x			
16	Digital Systems	Digital circuit design and analysis - Boolean algebra, logic gates, combinational circuits (decoders, plexers, iterative, ALU, custom circuits), synchronous sequential circuits (flip-flops, registers, counters, controllers, iterative, custom circuits).	x		x		x					
17	Electromagnetism	Maxwell's equations, Finite difference time domain method (FDTD), Finite element frequency domain method (FEM), Method of boundary element (BEM), Asymptotic methods (UTD, GTD, PO), Fundamentals of optimization algorithms in electromagnetics.	x				x					
18	English B2 module II	Second part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
19	English B2+ module II	Second part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
20	German B2 module II	Second part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
21	English C1 module II	Second part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
22	Numerical Methods	Floating point arithmetic, errors in numerical calculations. Interpolation and approximation, Richardson extrapolation. Numerical integration and differentiation, solution of systems of linear and non-linear equations, solution of initial problems, description of topology of electronic systems, nodal potential method (matrix description).	x				x					
23	Measurement Systems	A/D and D/A converters, DIO, computer-based measurement systems, hardware platforms, communication interfaces, testing of non-electrical quantity sensors and measurement transducers, measurement system architecture.					x					
24	Electronic Circuits	Linear amplifiers (behavioral description), Linear feedback, DC power supplies, Selection and stabilization of the operating point of active elements, Band amplifiers, DC amplifiers, Operational amplifier, Selective amplifiers, Sinusoidal signal generators, Linear and nonlinear pulse shaping circuits, Basic switching and gate circuits, Pulse regenerative circuits, Analog multipliers, Current sources and mirrors.			x			x				
25	Microelectronic Technologies	CMOS gates (pull-down, pull-up network). Technology: diffusion, ion implantation, etching, lithography, mask set for CMOS technology, CMOS gates and metastables: characteristics, transistor width selection, delay by Logical Effort method, Setup time & hold time, pseudo-NMOS, pass-transistor. IC design methodology. Basic analogue circuits operating: in voltage mode, in current mode. Passive elements in integrated circuits. Dynamic memories, eeprom, flash.			x			x				
26	Object Oriented Programming	Concepts of object-oriented programming: classes and objects, encapsulation, fields and methods, access control, constructors and destructors, operator overloading, friend classes and functions, inheritance, virtual functions, polymorphism, abstract classes, interface vs. implementation, type conversions, exceptions, templates (parameterized classes), and the Standard Template Library (STL).							x			
27	Programmable Devices	Programmable circuit architectures. Synthesizable and non-synthesizable VHDL language. Synchronous and asynchronous structures. State machines and communication interfaces. FPGA memory and resources (BRAM, computational resources). Simulations and testbenches. Basic constraints and timing closure. In-system debugging. Synchronization of different clock domains.			x		x		x			
28	Signal Processing	Continuous and discrete time signals. Elementary signals. Non-linear and linear systems. Linear convolution. Sampling of signals. Laplace transform and its applications. Z transform and its applications. Frequency analysis of signals and systems. Statistical analysis of signals. Examples of signal analysis applications. Digital filter structures. Selected methods of digital filter design.	x				x					

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
29	English B2 module III	Third part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
30	English B2+ module III	Third part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
31	German B2 module III	Third part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
32	English C1 module III	Third part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
33	Integrated Circuits	Integrated circuits: operational amplifiers, wideband and switching amplifiers, comparators, continuous-time and discrete-time filters, power amplifiers, analog-to-digital and digital-to-analog converters, gate drivers, H-bridges, multipliers. Noise in active circuits. Amplitude, frequency, and phase detectors. Phase-locked circuits.			x		x	x				
34	Power Electronic Supplies	Conversion of electrical energy. Continuous and switching operation of semiconductor devices. Series linear voltage stabiliser, DC voltage interrupter, pulse stabiliser with voltage reduction topology, feedback control, fill factor modulators and others, digital pulse signal generation, regulators, stability, compensation, integrated circuits and modules. Diode bridge rectifier. Design of power modules, especially pulsed power modules.			x		x	x				
35	Electronic Equipment Design	Electronic equipment design: environmental factors, reliability issues, thermal management, selection of cooling systems. Printed circuits: substrates, manufacturing technologies, design, surface mount and through-hole assembly, testing. Issues related to standardisation and product safety. Development of electronic device documentation that meets legal requirements, taking into account intellectual property protection elements.			x			x		x		x
36	Microprocessor Systems	Architecture: CPU, memory, periphery. Bit operations, register access. Access to peripheral circuits. Communication interfaces. Baremetal applications: peripheral operation, menu-driven system. Low power consumption systems. Assembler.			x				x			
37	Digital Communications	Fundamentals of digital communication. Transmission channels and interference. Analogue and digital modulation techniques. Information theory and coding. Error detection and correction. Communication protocols and standards: OSI and TCP/IP models. Telecommunications network technologies: Wired, wireless and fibre optic networks. Examples of telecommunications network standards. Telecommunications development trends.				x	x					
38	Optoelectronics	Fibre optoelectronics, optical systems in FTTH and DC applications, optical path elements, light sources, radiation detectors, control elements, optical fibres, optoelectronic circuit design, selected optical measurement techniques, photonics.	x			x	x					

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
39	English B2 module IV	Fourth part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
40	English B2+ module IV	Fourth part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
41	German B2 module IV	Fourth part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
42	English C1 module IV	Fourth part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of interpersonal skills oriented around the future working environment of the university graduate.								x		
43	Diagnostics of Electronic Circuits	Fault detection techniques. Diagnostics of analogue systems. Signal tracing and analysis. Diagnostics of digital circuits. Safety and best practice. Implementation based on practical case studies.			x		x					
44	High Frequency Electronics	Wave phenomena in electronic circuits, the phenomenon of signal reflection in electronic circuits, smith chart and impedance matching., waveguides, Impedance transformers, baluns and other passive RF components, basics of RF metrology.	x					x				
45	Embedded Systems	Architectures of programmable SoCs: communication between processing system and programable logic, advanced clock generation modules, communication interfaces and modules, memory resources. System-On-Modules. Advanced HDL description: high-level synthesis, advanced timing constraints, advanced IP-cores. Software: Bare-metal application, booting systems, Embedded OS.			x				x			
46	Wireless Systems and Networks	Basic diagram of the telecommunications system. Access and transport networks. Examples of telecommunications system standards. Legal considerations for the design, construction and operation of telecommunications infrastructure. Fundamentals of radio wave propagation in wireless communication systems, radio wave propagation models. Antennas. Power balance of a radio link. Telecommunications traffic and network capacity. Principles of radio planning for mobile communications. Basic transmission and reception techniques. Evolution of wireless communication systems. Impact of electromagnetic waves on people and the environment. Directions of development of wireless systems and techniques, including 6G cellular systems.				x	x	x				
47	Programming of Microprocessor Systems and Microcontrollers 1	Microprocessor systems in embedded and industrial applications, with particular emphasis on the internal design, architecture of microcontrollers and their peripherals, and their interaction with external devices using available communication interfaces. Issues related to embedded system programming methods, both in assembler and C, using available libraries and extensions. Microcontroller structures and methods for their programmatic handling: interrupts, ports, peripherals, and memory.			x				x			

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
48	Programming of Microprocessor Systems and Microcontrollers 2	Introduction to the structure and operation of a system equipped with peripherals. System buses. Programming peripheral device management, direct memory access (DMA), interrupt handling, synchronous and asynchronous data transfer. Basic types of memory. Principles of operation and structure of various basic memory cells. Memory parameters. Modern memory systems: SDRAM, DDR SDRAM. System cache. Basic types of peripheral devices: input/output devices, analog-to-digital and digital-to-analog converters. User communication interfaces: data visualization systems. Interrupt and direct memory access controllers. Computer communication buses.			x				x			
49	Microprocessor Control in Industrial Electronics 1	Design and operation of microcontrollers, including programming methods in assembler and C. Design and operation of integrated peripherals and communication interfaces. Design and operation of basic external peripherals, sensors, transducers, and actuators, and their practical applications.			x				x			
50	Microprocessor Control in Industrial Electronics 2	Microcontrollers interaction with peripheral, sensor, and actuator systems in industrial environments. Methods for implementing control systems, including principles of software algorithmization and application implementation and testing. Issues related to the specificity and typical operating conditions of industrial systems using microcontrollers. Issues related to testing, reliability, and resilience of industrial systems.			x				x			
51	Service and Testing of Electronic Devices 1	Common electronic equipment failures, electronic component reliability, and changes and degradation in electronic component parameters. Selection of device functional verification methods and testing methods. Repair procedures and electronic component replacement techniques.			x		x	x				
52	Energy Generation from Renewable Sources 1	General knowledge about the power system. Methods of connecting distributed sources to the supply grid. The impact of sources on grid operation. The role of storage in distributed generation networks. Prosumer installations. Electrochemical energy storage and renewable energy sources in island operation. Gas microturbines. Tracking photovoltaic systems. Wind farms. The impact of nonlinear loads on grid operation.										
53	Automotive Electronics 1	Classification and location of electronic components in vehicles. Operating environment of electromechanical components in cars. Overview of sensors used in the automotive industry. Inductive and Hall sensors. Potentiometric and temperature sensors. Analog-digital accelerator pedal sensors. Mass air flow (MAF) sensors. Lambda sensors. Pressure (MAP) sensors and strain gauges. Piezoelectric and capacitive sensors. Vision and ultrasonic sensors.			x		x					
54	Advanced Object-Oriented Programming	Selected modern object-oriented programming languages and the environments, tools, and libraries typically used with them. Concepts and methodologies related to software project development.							x			
55	Embedded Systems in IOT and IIOT Applications	Architecture, design methodology and programming of embedded systems built on microcontrollers, taking into account the specific requirements of IOT and IIOT systems.			x			x	x			
56	Fibre Optic Technologies and Networks 1	Fundamentals of fiber optic technologies used in the construction and operation of telecommunication networks. Methods for measurement and diagnostics of fiber optic links and components, fiber splicing technologies, and practical aspects of the installation, commissioning, and maintenance of fiber optic networks.	x				x					

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
57	Classical and Flexible Electronics Systems and Technologies 1	Types and applications of materials used in flexible electronics, types and characteristics of flexible substrates. Manufacturing technologies for components and systems in flexible electronics. Practical implementation of the project: a printed circuit board of an electronic system containing SMD components.			x		x	x				
58	Competence Project	Team project: identifying users/stakeholders, researching possible solutions, selecting the best solutions taking into account the product life cycle, prototyping, testing/evaluation. Detailed content depends on the selected and implemented project in the field of scientific disciplines to which the programme is assigned.		x	x		x	x		x	x	x
59	Internship	Acquisition of practical knowledge and new professional skills in the natural conditions of the workplace.		x							x	x
60	Processors and Operating Systems in Industrial Applications 1	Issues of electronic control and monitoring of systems in industrial environments and specifics, with particular emphasis on control using RISC (32-bit) processors for embedded and microcontroller applications. The design and operation of a processor utilizing advanced operating modes, various instruction set lists, and highly specialized resources adapted to the implementation of a real-time operating system.			x				x			
61	Processors and Operating Systems in Industrial Applications 2	The structure and operation of real-time operating systems, preemption systems, schedulers, selection and optimization of task switching criteria and methods, as well as semaphores, queues, and mutexes. Basic concepts related to memory management units (MPUs/MMUs).			x				x			
62	Industrial Controllers and Computers and HMI SCADA Packages 1	Issues of electronic control and supervision of systems in industrial conditions and specifics. Issues of the design and operation of industrial controllers, PAC computers, and their expansion cards, industrial signal standards, programming methods, and applicable language standards. LD, IL, SFC, FBD, and ST languages. Program algorithmization methods. Fundamentals of industrial networks.			x				x			
63	Industrial Controllers and Computers and HMI SCADA Packages 2	Superior control, supervision, and process visualization using SCADA in industrial settings and specifics. Industrial databases, recommendations for creating visualizations, advanced reporting, access protection, and production logs. Operation of SCADA systems using industrial networks. SCADA programming in scripting languages. Basic concepts: MES, ERP, BMS.			x				x			
64	Service and Testing of Electronic Devices 2	Design and simulation methods for electronic devices. Principles for selecting the main circuit diagram and component values based on criteria such as availability, tolerance, noise and distortion, voltage drift, and temperature. Design of electronic systems based on safety, reliability, and redundancy. Basic principles of designing equipment with enhanced reliability.			x		x	x				
65	Electronic Equipment Design Problems	Design decisions and design trade-offs; project specification, requirements and boundaries; electronic equipment architecture and selection of the electronic circuit concepts; selection of proper commercially available components; schematic as a basis for design decisions; design of printed circuit board suitable for assembly, commissioning and testing; initial prototype commissioning and test plan; fault diagnosis and design modifications; documentation of technical decisions and justification of the design.			x		x	x				

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
66	Energy Generation from Renewable Sources 2	Detailed discussion of renewable energy sources. An overview of renewable energy sources. Energy efficiency. Solar energy – photovoltaics (PV). Solar energy – collectors and concentrators. Wind energy, geothermal energy, and bioenergy. Hydropower and marine energy. Off-grid photovoltaic systems, photovoltaic module configurations, the impact of lighting conditions, temperature, and cell mismatch on photovoltaic module performance. Design of hybrid installations.										
67	Radio Communication Systems	Fundamentals of modern radio communication systems - architectures, radio interfaces, channel organization, and transmission and access mechanisms. Spectrum management, radio wave propagation modelling, interference resilience, software-defined radio, quality-of-service assessment, node localization methods. Overview of key radiocommunication standards and applications.				x	x	x				
68	Automotive Electronics 2	Automotive Starting Systems and Alternators. Physical Basics of Spark Ignition and Compression Ignition Engines. Air-Fuel Mixture Formation Systems. Injectors in Gasoline and Diesel Engines. Ignition Systems in Gasoline Engines. Vehicle Data Buses (CAN, LIN, FlexRay, MOST). Active and Passive Safety Systems. Vehicle Comfort and Lighting Systems. Noxious Substance Emission Reduction Systems. Hybrid and Electric Drive Systems in Vehicles. The Use of Fuel Cells in Vehicles. Autonomous Vehicles – Technical and Social Problems. Failures and Damage to Electromechanical and Electronic Components in Vehicles. Test Procedures and Diagnostic Methods.			x		x					
69	Fibre Optic Technologies and Networks 2	Architecture, operating principles, and standards of passive optical networks. Methods for designing fiber optic infrastructure, including the selection of network topology, passive and active components, transmission parameters, and optical power budget analysis.	x				x					
70	Advanced fibre optic sensors	Advanced fiber optic sensing technologies and measurement methods based on optical phenomena in optical fibers. Principles of operation, characteristics, and design of point and distributed fiber optic sensors for measurement and structural health monitoring applications.	x				x	x				
71	Fibre Optic and Optoelectronic Sensors and Measurement Systems	Safety when working with lasers, polymer optical fibers, techniques for connecting optical fibers and coupling light sources with optical fibers, fiber optic sensors based on glass and polymer optical fibers with internal and external processing - construction and principle of operation, types of sensors and their applications, industrial optical, optoelectronic and radiation sensors, optical methods and systems for gas detection (OGI).			x		x	x				
72	Thermal Imaging	Fundamentals of infrared physics, design and parameters of thermal imaging cameras, practical applications of thermal imaging cameras (electronics, energy systems, civil engineering, etc.), active thermal imaging, non-destructive testing, spectral thermal imaging, optical gas detection, hyperspectral imaging, preparation of thermal imaging test reports.	x				x					
73	Reconfigurable Embedded Systems	Design of advanced systems based on reconfigurable devices: development of custom IP blocks and their integration using standard interfaces, implementation of high-speed external device interfaces, data serialization and deserialization, delay calibration, and clock phase control, advanced clock domain synchronization using dedicated components as well as synthesis directives and timing constraints, system optimization, along with tools for debugging and profiling.			x				x			

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
74	Classical and Flexible Electronics Systems and Technologies 2	Flexible photovoltaics: physical fundamentals, materials used, overview of technologies and applications. Textronics: areas of application, constraints and limitations, textronic technologies. The process of creating electronic devices: specification, block diagrams and circuit diagrams, printed circuit boards (PCB), verification of design correctness, preparation for manufacturing, prototyping. The role of simulation in the design process of circuit diagrams and printed circuit boards. Design rules and practical principles of PCB design. CAD tools supporting the design and implementation of electronic devices. The fabrication of a flexible element. Methods of layers deposition on flexible substrates, testing the properties of flexible electronic components. Construction and testing of a prototype of the designed device combining a flexible module performing a specific function with a classical electronic circuit on a rigid substrate.			x		x	x				
75	Mobile Device Programming	History and evolution of mobile operating systems, and architectural limitations of the mobile environment. Distribution methods and the lifecycle of mobile applications. User interface design tailored to mobile device specifications. Integration of multimedia features and location-based services. Configuration of mobile development environments, project management, testing techniques, and deployment of mobile software packages.							x			
76	Integrated Circuit Design and Manufacturing Technologies	Microelectronic technologies: semiconductor materials: fabrication and properties; semiconductor fabrication technologies; structure assembly and hermetic sealing; mechatronic technologies; structure characterization during manufacturing process. Integrated circuit design methodology: basic analog circuits; signal converters; design flow for analog and digital circuits; mixed-signal analog-digital circuits; placement and power supply (floorplaning) of analog, digital, and peripheral blocks in integrated circuits.			x			x				
77	Entrepreneurship and Innovation	Innovation and academic entrepreneurship in the context of engineering activities. Identification, analysis, and development of innovative technological solutions and evaluation of their market potential. Business models and innovation implementation processes, including the commercialization of research results. Legal and economic conditions of entrepreneurial activity and the management of intellectual property.								x		x
78	Diploma Seminar	Research methodology, rules for thesis writing and presentation and discussion of thesis results. Preparation for the competency examination to check the aggregated learning outcomes.		x	x					x		
79	Final Project	Implementation of the correct methodology for completing an engineering thesis: literature review and objective formulation. Identification of specific tasks. Selection of methods and tools appropriate to the problem being solved. Conducting simulation and/or experimental tests and analysis of the obtained results. Description of the results. The specific content depends on the chosen topic of the project.			x		x			x	x	x
80	Reconfigurable Systems and DSPs In Industrial Applications 1	Reprogrammable and reconfigurable electronic circuits. Basic types: PLD, CPLD, FPGA; their structure, characteristics, and application preferences. Implementation of Boolean, combinational, and sequential functions, state machines, and advanced signal processing algorithms. Introduction to SoC and PSoC. Basic hardware description languages (HDL), behavioral and structural description methods, a complete design path, concurrency and hierarchical structure creation, and microprogrammed systems.			x				x			

No.	Course name	Program content	1EIT1	1EIT10	1EIT2	1EIT3	1EIT4	1EIT5	1EIT6	1EIT7	1EIT8	1EIT9
81	Reconfigurable Systems and DSPs In Industrial Applications 2	Implementation of DSP signal processing systems, including the theoretical foundations of analog and digital filter design and implementation, spectral analysis, and Fourier transforms. Implementation of arithmetic in digital systems, DSP design and operation, architecture, and essential DSP peripherals: ADC and DAC. Programming DSP processors and implementing selected algorithms.			x				x			
82	Implementation of Digital Signal Processing Algorithms in Industrial Systems 1	Fundamentals and implementation methods of modern graphical and acoustic signal processing systems, signal compression (lossy and lossless), theoretical foundations of the design and implementation of analog and digital filters, spectral analysis and Fourier transforms, data compression, error detection and compression algorithms. Projection methods and spatial transformations, bilinear projections and distortions.			x				x			
83	Implementation of Digital Signal Processing Algorithms in Industrial Systems 2	Fundamentals and methods of implementing arithmetic in digital systems, the design and operation of digital signal processors, the architecture of signal processors, and the necessary peripheral circuits for DSPs: ADCs and DACs. Specifics of DSP programming and the implementation of selected signal processing algorithms: SOI and NOI filter implementation, adaptive filters, spectral signal analysis, data compression, error detection and compression algorithms.			x				x			
84	Artificial Intelligence in Microprocessors and Mobile Devices	Design, operation, and practical implementation of AI in systems with microcontrollers (edge devices) and mobile systems (mobile phones), using electronic monitoring and control circuits as examples, as well as situational awareness of the environment (using neural networks and AI). Basic knowledge of the following machine learning techniques: neural networks (unidirectional, recurrent (RNN), convolutional (CNN)), logistic regression, and support vector machines (SVM).							x			
85	Electronic Systems Design	Defining design assumptions, selection of key components, electrical schematic design, printed circuit board (PCB) design, preparation of manufacturing files, development of control software for the system, assembly, commissioning, preparation of documentation.			x		x	x				
86	Antenna Technology	Fundamental issues of antenna engineering, the role of an antenna in wireless systems, the influence of antenna parameters on wireless transmission, the most important antenna parameters, basic antenna types and structures, the technology of antenna fabrication, introduction to numerical methods used in antenna simulations, the analysis of wire antennas and microstrip antennas with the use of computer tools, the measurement of antenna parameters and the interpretation of simulation and experimental results.				x	x	x				
87	Radio Wave Propagation	Fundamentals of electromagnetic fields and waves and their relevance to the physical layer of wireless systems. Antenna parameters. Radio wave propagation in diverse environments, including reflection, diffraction, and attenuation phenomena. Theoretical and empirical propagation models used in the analysis and design of radiocommunication systems.				x	x	x				
88	Automation in Fibre Optic Measurements	Methods for the automation of measurement processes in fiber optic technology, planning and analysis of measurement systems, and reliability assessment of fiber optic components in accordance with metrological requirements and applicable standards. Design of automated measurement stations for fiber optic applications.					x		x			

ECTS - subjects

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
1	Mathematics I	8				
2	Physics	4				
3	Electrical Circuits	6			6	
4	Materials Physics	3				
5	University Skills	3	3		3	
6	Basics of Programming	4				
7	Engineering Graphics and Documentation	2				
8	English B2 module I	2		2		
9	English B2+ module I	2		2		
10	German B2 module I	2		2		
11	English C1 module I	2		2		
12	Mathematics 2	4				
13	Measurements and Statistics	5			5	
14	Introduction to Electronics	6			6	
15	Procedural Programming	4			4	
16	Digital Systems	5			5	
17	Electromagnetism	4			4	
18	English B2 module II	2		2		
19	English B2+ module II	2		2		
20	German B2 module II	2		2		

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
21	English C1 module II	2		2		
22	Numerical Methods	4			4	
23	Measurement Systems	3			3	
24	Electronic Circuits	4			4	
25	Microelectronic Technologies	5			5	
26	Object Oriented Programming	4			4	
27	Programmable Devices	4			4	
28	Signal Processing	4			4	
29	English B2 module III	2		2		
30	English B2+ module III	2		2		
31	German B2 module III	2		2		
32	English C1 module III	2		2		
33	Integrated Circuits	4			4	
34	Power Electronic Supplies	5			5	
35	Electronic Equipment Design	6			6	
36	Microprocessor Systems	5			5	5
37	Digital Communications	4			4	
38	Optoelectronics	4			4	
39	English B2 module IV	3		3		
40	English B2+ module IV	3		3		
41	German B2 module IV	3		3		

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
42	English C1 module IV	3		3		
43	Diagnostics of Electronic Circuits	4			4	
44	High Frequency Electronics	4			4	
45	Embedded Systems	3			3	
46	Wireless Systems and Networks	6			6	
47	Programming of Microprocessor Systems and Microcontrollers 1	5		5	5	
48	Programming of Microprocessor Systems and Microcontrollers 2	5		5	5	
49	Microprocessor Control in Industrial Electronics 1	5		5	5	
50	Microprocessor Control in Industrial Electronics 2	5		5	5	
51	Service and Testing of Electronic Devices 1	5		5	5	
52	Energy Generation from Renewable Sources 1	5		5	5	
53	Automotive Electronics 1	5		5	5	
54	Advanced Object-Oriented Programming	5		5	5	
55	Embedded Systems in IOT and IIOT Applications	5		5	5	
56	Fibre Optic Technologies and Networks 1	5		5	5	
57	Classical and Flexible Electronics Systems and Technologies 1	5		5	5	
58	Competence Project	9		9	9	
59	Internship	6				
60	Processors and Operating Systems in Industrial Applications 1	5		5	5	
61	Processors and Operating Systems in Industrial Applications 2	5		5	5	
62	Industrial Controllers and Computers and HMI SCADA Packages 1	5		5	5	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
63	Industrial Controllers and Computers and HMI SCADA Packages 2	5		5	5	
64	Service and Testing of Electronic Devices 2	5		5	5	
65	Electronic Equipment Design Problems	5		5	5	
66	Energy Generation from Renewable Sources 2	5		5	5	
67	Radio Communication Systems	5		5	5	
68	Automotive Electronics 2	5		5	5	
69	Fibre Optic Technologies and Networks 2	5		5	5	
70	Advanced fibre optic sensors	5		5	5	
71	Fibre Optic and Optoelectronic Sensors and Measurement Systems	5		5	5	
72	Thermal Imaging	5		5	5	
73	Reconfigurable Embedded Systems	5		5	5	
74	Classical and Flexible Electronics Systems and Technologies 2	5		5	5	
75	Mobile Device Programming	5		5	5	
76	Integrated Circuit Design and Manufacturing Technologies	5		5	5	
77	Entrepreneurship and Innovation	2	2			
78	Diploma Seminar	3				
79	Final Project	15		15	15	
80	Reconfigurable Systems and DSPs In Industrial Applications 1	5		5	5	
81	Reconfigurable Systems and DSPs In Industrial Applications 2	5		5	5	
82	Implementation of Digital Signal Processing Algorithms in Industrial Systems 1	5		5	5	
83	Implementation of Digital Signal Processing Algorithms in Industrial Systems 2	5		5	5	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
84	Artificial Intelligence in Microprocessors and Mobile Devices	5		5	5	
85	Electronic Systems Design	5		5	5	
86	Antenna Technology	5		5	5	
87	Radio Wave Propagation	5		5	5	
88	Automation in Fibre Optic Measurements	5		5	5	

ECTS indicators

Name	Value
The total number of ECTS credits that a student must obtain through elective courses (amounting to no less than 30% of the total ECTS credits required to obtain the qualification corresponding to the given level of study)	68/210 (32.38%)
The total number of ECTS credits to be earned by a student through courses in the fields of humanities or social sciences	5
The total number of ECTS credits that a student must obtain from courses related to research conducted at the university, amounting to more than 50% of the total ECTS credits required to graduate from a given level of study	165/210 (78.57%)

Methods of verifying and assessing learning outcomes

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

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

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

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

Professional internships

Duration: 6 weeks

ECTS credits: 6

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

Characteristics of the course

Graduate profile

Graduates of first-cycle Electronics and Telecommunications programs have advanced competencies in identifying, formulating, and solving complex engineering problems in electronics and telecommunications. They can plan and conduct experiments, including measurements and computer simulations, as well as interpret their results and diagnose system malfunctions. They are skilled at formulating design assumptions, preparing technical specifications, and designing, modifying, and expanding electronic and telecommunications systems using appropriate methods, components, technologies, and design and simulation tools. They can implement algorithms in microprocessor systems and programmable logic systems, integrating hardware and software. Graduates can effectively acquire information and communicate using specialized terminology in electronics and telecommunications, also in a foreign language. They can present and evaluate diverse perspectives and lead substantive discussions. They function effectively in teams, participating in goal setting, planning, and implementing collaborative tasks. They are ready to take on engineering and design work in companies and institutions in the electronics, telecommunications, and IT sectors, as well as other areas of expertise. Thanks to their preparation for further independent learning, they can manage their own professional development and/or pursue second-cycle studies.

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

With reference to the "Strategy of Lodz University of Technology for 2025-2030" (Resolution No. 39/2024 of the Senate of Lodz University of Technology of June 26, 2024), the developed study program is related to the following objectives:

1. EDUCATION Area, Specific Objective 2: Improving the educational offer, including supplementary forms of education, in response to the challenges of the socio-economic environment. The concept and content of the program were extensively consulted with the socio-economic environment. The Business Council established for the program also serves an advisory and consultative role during the program's implementation.
2. EDUCATION Area, Specific Objective 3: Strengthening the talent management process by individualizing the education paths of undergraduate and doctoral students. The new program includes an expanded and more diverse range of elective courses, allowing for even better tailoring of education paths to individual student preferences.
3. EDUCATION Area, Specific Objective 5: Increasing student participation in research conducted at the university and intensifying students' practical experience outside the university. Program subjects are largely taught by research-active scientists, including supervisors of student research groups. Project-based subjects, in particular, offer topics related to research activities conducted at Lodz University of Technology. Students often continue working on such topics in direct collaboration with Lodz University of Technology units offering courses in the program. The program also includes 6-week student internships.
4. STUDENTS Area, Specific Objective 1: Supporting students in achieving key competencies aligned with labor market expectations. Thanks to well-established cooperation with the socio-economic environment, the program is optimized for students to achieve these key competencies. Furthermore, the program includes 6-week student internships, including those offered by proven business partners, which ensures the additional development of skills and attitudes expected by the labor market.

Educational objectives and employment and continuing education opportunities

1. Preparation for engineering problem-solving - developing the ability to identify, formulate, and solve complex engineering problems in the area of electronics and telecommunications, using theoretical knowledge, analytical methods, and engineering tools.
2. Development of experimental and analytical competencies - planning and conducting experiments, including laboratory measurements and computer simulations, as well as interpreting their results and diagnosing malfunctions in electronic and telecommunications systems.
3. Preparation for designing electronic and telecommunications systems - formulating design assumptions, developing technical specifications, designing, modifying, and expanding electronic and telecommunications systems using appropriate methods, components, technologies, and design support tools.
4. Development of skills in implementing algorithms in embedded systems and programmable systems, taking into account hardware and software integration.
5. Development of communication and information competencies - the ability to effectively acquire information and communicate using specialized terminology in the field of electronics and telecommunications, including in a foreign language, at a level that allows for the fluent use of technical knowledge.
6. Development of interpersonal and teamwork competencies - preparation for effective work in project teams, including collaborative goal setting, task planning, and responsible execution of assigned responsibilities.
7. Preparation for professional activity - to undertake engineering and design work in companies and institutions operating in the fields of electronics, telecommunications, IT, and related industries requiring competencies in these fields.
8. Shaping a developmental mindset - independently expanding knowledge and competencies, consciously managing one's own

professional development, and continuing education in second-cycle studies.

Graduates of first-cycle studies in electronics and telecommunications can pursue engineering and design positions in companies and institutions in the electronics, telecommunications, IT, and other industries operating in these areas. By preparing for further independent learning, they can manage their own professional development and/or pursue second-cycle studies in electronics and telecommunications or other fields related to electronics, telecommunications, or IT.

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

As part of the preparations for the program update, a meeting with representatives of six entities from the socio-economic environment was held in 2023, supplemented by a survey completed by nine entities. In September 2024, a Business Council was established at the Electronics and Telecommunications and Electronic and Telecommunication Engineering Program Council, consisting of six people – representatives of companies representing industries closely related to the subject matter of the program (Liki Mobile Solutions, RATEART, ZF, Solinerg, Corning, Ericsson). In December 2024, a meeting was held devoted entirely to consultations on the new Electronics and Telecommunications study program.

As a result of consultations with the socio-economic environment, key competencies for graduates of the program were identified, of which the following are particularly important for the second-cycle program:

- Diagnosing faults and finding errors: The ability to detect and locate errors in electronic systems, which is essential for solving technical problems.
- Maintaining and expanding systems: Graduates should be able to develop and maintain existing systems, projects in which they have not previously participated.
- Teamwork and project management skills, including the ability to collaborate effectively in interdisciplinary teams.
- Willingness to work on large projects: Ability to work on extensive systems that require both the development of new components and the maintenance and expansion of existing solutions.
- Orientation towards continuous development (Life Long Learning): Ability to quickly adopt new technologies and adapt to changing market conditions.

Analysis of company representatives' responses indicates that a graduate of Electronics and Telecommunications should possess interdisciplinary knowledge and skills combining a solid technical foundation with a flexible approach to solving complex problems. Soft skills, such as teamwork, project management using agile methodologies, and a strong motivation for continuous professional development are also essential, enabling adaptation to the dynamically changing technology market.

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

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

The unit organizing education

Faculty of Electrical, Electronic, Computer and Control Engineering

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mathematics I	Tutorials: 75 Lecture: 45	8	Exam	Obligatory
Physics	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Electrical Circuits	Tutorials: 30 Laboratory classes: 15 Lecture: 45	6	Graded assignment	Obligatory
Materials Physics	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
University Skills	Seminar: 35	3	Graded assignment	Obligatory
Basics of Programming	Laboratory classes: 40 Lecture: 5	4	Graded assignment	Obligatory
Engineering Graphics and Documentation	Laboratory classes: 30	2	Graded assignment	Obligatory
Sum	410	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physical Education 1	Tutorials: 30	0	Pass	Obligatory
Foreign Language Module 1		2	Graded assignment	Obligatory group
The student chooses 1 module				
English B2 module I	Tutorials: 30	2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
English B2+ module I	Tutorials: 30	2	Graded assignment	Optional
German B2 module I	Tutorials: 30	2	Graded assignment	Optional
English C1 module I	Tutorials: 30	2	Graded assignment	Optional
Mathematics 2	Tutorials: 60 Lecture: 15	4	Exam	Obligatory
Measurements and Statistics	Tutorials: 15 Laboratory classes: 15 Lecture: 30	5	Graded assignment	Obligatory
Introduction to Electronics	Laboratory classes: 60 Lecture: 30	6	Graded assignment	Obligatory
Procedural Programming	Laboratory classes: 40 Lecture: 5	4	Graded assignment	Obligatory
Digital Systems	Tutorials: 15 Laboratory classes: 15 Lecture: 30	5	Graded assignment	Obligatory
Electromagnetism	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Sum	435	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physical Education 2	Tutorials: 30	0	Pass	Obligatory
Foreign Language Module 2		2	Graded assignment	Obligatory group
The student chooses 1 module				
English B2 module II	Tutorials: 30	2	Graded assignment	Optional
English B2+ module II	Tutorials: 30	2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
German B2 module II	Tutorials: 30	2	Graded assignment	Optional
English C1 module II	Tutorials: 30	2	Graded assignment	Optional
Numerical Methods	Tutorials: 15 Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Measurement Systems	Laboratory classes: 24 Project work: 6 Lecture: 15	3	Graded assignment	Obligatory
Electronic Circuits	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Microelectronic Technologies	Laboratory classes: 45 Lecture: 15	5	Graded assignment	Obligatory
Object Oriented Programming	Laboratory classes: 40 Lecture: 5	4	Graded assignment	Obligatory
Programmable Devices	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Signal Processing	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Sum	435	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physical Education 3	Tutorials: 30	0	Pass	Obligatory
Foreign Language Module 3		2	Graded assignment	Obligatory group
The student chooses 1 module				
English B2 module III	Tutorials: 30	2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
English B2+ module III	Tutorials: 30	2	Graded assignment	Optional
German B2 module III	Tutorials: 30	2	Graded assignment	Optional
English C1 module III	Tutorials: 30	2	Graded assignment	Optional
Integrated Circuits	Laboratory classes: 40 Lecture: 20	4	Graded assignment	Obligatory
Power Electronic Supplies	Laboratory classes: 45 Lecture: 15	5	Graded assignment	Obligatory
Electronic Equipment Design	Laboratory classes: 30 Project work: 20 Lecture: 30	6	Graded assignment	Obligatory
Microprocessor Systems	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Obligatory
Digital Communications	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Optoelectronics	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Sum	440	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Foreign Language Module 4		3	Exam	Obligatory group
The student chooses 1 module				
English B2 module IV	Tutorials: 30	3	Exam	Optional
English B2+ module IV	Tutorials: 30	3	Exam	Optional
German B2 module IV	Tutorials: 30	3	Exam	Optional
English C1 module IV	Tutorials: 30	3	Exam	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Diagnostics of Electronic Circuits	Laboratory classes: 45 Lecture: 15	4	Graded assignment	Obligatory
High Frequency Electronics	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Embedded Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Wireless Systems and Networks	Laboratory classes: 30 Project work: 30 Lecture: 30	6	Graded assignment	Obligatory
Elective Courses 1		10	Graded assignment	Obligatory group
The student chooses 2 subjects				
Programming of Microprocessor Systems and Microcontrollers 1	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Programming of Microprocessor Systems and Microcontrollers 2	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Microprocessor Control in Industrial Electronics 1	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Microprocessor Control in Industrial Electronics 2	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Service and Testing of Electronic Devices 1	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Energy Generation from Renewable Sources 1	Laboratory classes: 25 Project work: 15 Lecture: 20	5	Graded assignment	Optional
Automotive Electronics 1	Laboratory classes: 30 Project work: 10 Lecture: 20	5	Graded assignment	Optional
Advanced Object-Oriented Programming	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Embedded Systems in IOT and IIOT Applications	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Fibre Optic Technologies and Networks 1	Laboratory classes: 45 Lecture: 15	5	Graded assignment	Optional
Classical and Flexible Electronics Systems and Technologies 1	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Sum	405	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Competence Project	Project work: 90 Lecture: 20	9	Exam	Obligatory subjects to choose from
Internship	Internship: 0	6	Pass	Obligatory
Elective Courses 2		15	Graded assignment	Obligatory group
The student chooses 3 subjects				
Processors and Operating Systems in Industrial Applications 1	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Processors and Operating Systems in Industrial Applications 2	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Industrial Controllers and Computers and HMI SCADA Packages 1	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Industrial Controllers and Computers and HMI SCADA Packages 2	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Service and Testing of Electronic Devices 2	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Electronic Equipment Design Problems	Project work: 45 Lecture: 15	5	Graded assignment	Optional
Energy Generation from Renewable Sources 2	Laboratory classes: 25 Project work: 15 Lecture: 20	5	Graded assignment	Optional
Radio Communication Systems	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Automotive Electronics 2	Laboratory classes: 30 Project work: 10 Lecture: 20	5	Graded assignment	Optional
Fibre Optic Technologies and Networks 2	Project work: 45 Lecture: 15	5	Graded assignment	Optional
Advanced fibre optic sensors	Laboratory classes: 15 Project work: 30 Lecture: 15	5	Graded assignment	Optional
Fibre Optic and Optoelectronic Sensors and Measurement Systems	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Thermal Imaging	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Reconfigurable Embedded Systems	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Classical and Flexible Electronics Systems and Technologies 2	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mobile Device Programming	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Integrated Circuit Design and Manufacturing Technologies	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Sum	290	30		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Entrepreneurship and Innovation	Project work: 20 Lecture: 10	2	Graded assignment	Obligatory
Diploma Seminar	Seminar: 20	3	Graded assignment + exam	Obligatory
Final Project	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Elective Courses 3		10	Graded assignment	Obligatory group
The student chooses 2 subjects				
Reconfigurable Systems and DSPs In Industrial Applications 1	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Reconfigurable Systems and DSPs In Industrial Applications 2	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Implementation of Digital Signal Processing Algorithms in Industrial Systems 1	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional
Implementation of Digital Signal Processing Algorithms in Industrial Systems 2	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Artificial Intelligence in Microprocessors and Mobile Devices	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Electronic Systems Design	Laboratory classes: 60	5	Graded assignment	Optional
Antenna Technology	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Radio Wave Propagation	Laboratory classes: 30 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Automation in Fibre Optic Measurements	Project work: 45 Lecture: 15	5	Graded assignment	Optional
Sum	170	30		