



Lodz University
of Technology

Study programme

Faculty:	Faculty of Electrical, Electronic, Computer and Control Engineering
Major:	Automation and Robot Control
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:	Automation and Robot Control
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:	2720
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:	109
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	90%
Technical computing and telecommunications	10%

Learning outcomes (in relation to the PQF)

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
1	1ASR1	Knows and understands, at an advanced level, the facts, theories, methods, and complex interrelations between them within the scientific disciplines related to the field of study, in particular: automation, electronics, electrical engineering, computer science, and telecommunications.	P6U_W	P6S_WG
2	1ASR2	Knows and understands the basic economic, legal, ethical and other conditions of various types of professional activities related to the field of automation and robot control.	P6U_W, P6U_U	P6S_WK, P6S_WG_inž, P6S_WK_inž, P6S_UW_inž
3	1ASR3	Has the ability to analyze and design automation and robotics devices and systems for various application areas, as well as the ability to develop software, considering real technical and non-technical constraints, using modern IT tools, including modeling and simulation of electronic and control systems.	P6U_U	P6S_UW, P6S_UW_inž
4	1ASR4	Is able to plan and conduct experiments, especially in the area of prototyping new control and identification algorithms; perform measurements, critical data analysis, interpretation, presentation, and discussion of results; prepare documentation; and use appropriate IT tools.	P6U_U	P6S_UW, P6S_UW_inž
5	1ASR5	Can communicate effectively with the environment, including using a foreign language at least at B2 level and terminology related to automation and robot control; can formulate arguments supported by knowledge in the field of study and present, evaluate, and discuss various opinions and statements.	P6U_U	P6S_UK
6	1ASR6	Is able to independently acquire and apply new knowledge, as well as plan and organize individual and team work.	P6U_U	P6S_UO, P6S_UU
7	1ASR7	Is ready to critically assess their own knowledge and received content in the context of engineering problems in automation and robotics; understands the need to seek opinions from experts and system users.	P6U_K	P6S_KK
8	1ASR8	Is ready to carry out tasks responsibly and to think and act in a socially useful and ethical manner.	P6U_K	P6S_KO, P6S_KR

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

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
1	Mathematics I	Propositional calculus and algebra of sets. Elementary functions (transforming graphs, equations, inequalities). Differential and integral calculus functions of one variable. Complex numbers. Matrix calculus. Systems of linear equations.	x							
2	Physics I	Oscillation. Mechanical waves. Wave phenomena. Geometrical optics. Light as an electromagnetic wave. Wave properties of electromagnetic waves. Particle properties of electromagnetic waves. Wave-particle duality. Structure of the atom. Basics of nuclear physics (nucleus structure, nuclear radiation, nuclear reactions). Basics of thermodynamics. Thermoelectric effects. Basics of quantum physics. Structure of matter. Motion of particles in an electromagnetic field.	x			x		x		
3	Electric Circuits I	Analysis of linear direct current circuits using: Kirchhoff's laws, the node voltage method, the superposition theorem, equivalent circuits, Thevenin's and Norton's theorems, Tellegen's theorem. Analysis of linear circuits driven by sinusoidal voltage and current sources: the complex number method - introduction, concepts of the impedance and the admittance, powers of circuit elements, phasor diagrams. Basic information about the electromagnetic field.	x		x					
4	Statics and Kinematics	Equilibrium of rigid body in concurrent and arbitrary force systems. Modeling of dry friction. Kinematics of rigid body (translational, rotational and planar motion). Relative motion with rotating reference.	x							
5	First CS Project	Fundamentals of algorithms, algorithm creation and analysis, algorithm correctness and efficiency. Programming in C and Python. The software development cycle: selecting data types and control structures, using arrays, strings, pointers, and data structures, memory management, debugging, and testing. Students can choose from three project options: solving an algorithmic problem with complexity analysis and appropriate data structures; creating a modular program divided into functions/modules with unit testing and interface documentation; or developing an application with a simple user interface and integration with a web service or data persistence mechanism.	x			x				
6	Contemporary Engineering, Safety, and Standardization	The specificity of automation. Scientific research on contemporary automation and its connection to the topics of classes. Basic concepts and principles of robotic automation. Contemporary development trends in automation and robotics. The role and importance of automation and robotics for the economy and society. Basic concepts of standardization . Safety requirements for machinery. Awareness of hazards posed by electric current, shock protection measures, and their areas of application.	x	x						
7	Engineering Drawing	Standardized elements of technical drawing. Orthographic projection, views, sections, and removed sections (projection methods, views, sections, half-views, half-sections, local sections, breaks and interruptions, hatching rules, drawing objects with repetitive features). Principles of dimensioning. Modern tools for creating technical documentation.	x		x					
8	Mathematics II	Analytic geometry in 3-space. Eigenvalues and eigenspaces of matrices and linear operators. Differential calculus of functions of several variables. Ordinary differential equations. Fourier series. Complex functions of complex variable (residue calculus). Laplace transform with applications to solving systems of linear differential equations.	x							

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
9	Information Technology	Algorithmization, object-oriented programming. Software quality, application testing. Programming languages. Fundamentals of computer networks, network services, and cybersecurity, including data protection and the safe use of IT systems. Version control systems, code analysis tools, and selected artificial intelligence tools supporting the software development process. Elements of the software and IT product lifecycle.	x		x					
10	Electric Circuits II	Analysis of linear circuits driven by sinusoidal voltage and current sources: complex number method continued, theorem on the maximum power transfer, magnetically coupled inductors, resonant circuits, phasor diagrams. A Fourier series. Parseval's theorem. Analysis of linear circuits driven by periodic non-sinusoidal voltage and current sources. Analysis of first- and second-order dynamic circuits in the time domain. Symmetrical and asymmetrical three-phase systems. The symmetrical components method. Multi-phase systems.	x		x					
11	Physics II: Dynamics & Mechanical Systems	Dynamics of particles and rigid bodies - modeling of dynamical systems using differential equations. Kinematics and dynamics of non-uniformly accelerated motion. Mass moment of inertia. Conservation laws: momentum, angular momentum, energy. Balance of angular momentum. Work. Lagrange's equations. Experimental study of real systems in the field of theoretical mechanics and strength of materials.	x			x				
12	Fundamentals of Electronics	Semiconductor devices. Safe operation area of transistors. Operating point of transistors. Switching operation of transistors. Heat dissipation from electronic components. Low- and high-power transistor amplifiers. Feedback in electronic circuits. Operational amplifiers (Op-Amps). Sinusoidal and flip-flop generators. Power supply and stabilizing circuits.	x			x				
13	Computer Architecture and Operating Systems	Fundamentals of computer architecture. CPU architecture and instruction cycle. Arithmetic-logic operations and floating-point operations. Memory types and data addressing. Machine code instructions. Assembly language and high-level languages. Translation from high-level language to assembly code. Operating systems: functions and types. Working in the Linux environment. Selected Bash shell commands. Shell scripting. Management of files, software, and permissions.	x			x				
14	English B2 module I	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 1					x		x	
15	English B2+ module I	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 1					x		x	
16	German B2 module I	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 1					x		x	
17	English C1 module I	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 1.					x		x	
18	Metrology	Measurement accuracy, uncertainty, and rounding. Unit systems. Processing measurement results. Static and dynamic properties of measuring instruments. Measurement methods and selection of measurement equipment. Signal processing and transducers. Measurements of basic electrical quantities. Analog and digital multimeters and oscilloscopes. Virtual instruments. Computer-based measurement systems.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
19	Numerical Methods	Errors in numerical calculations, conditioning, and computational complexity. Selected numerical methods Algorithmization and implementation of numerical methods, software selection and application, computer simulation. Programming in Matlab. Applications to automation and robotics. Evaluation of the reliability of obtained results. Selection of methods and evaluation of the correctness of results.	x			x		x		
20	Computer Measurement Systems in Automatics	Structure and properties of computer measurement systems. Interfaces in measurement systems. Wireless transmission of measurement data. Measurement signal conditioning systems. Construction and operation of data acquisition cards. Processing and presentation of measurement data. Software in measurement systems.	x			x				
21	Measurement Techniques in Mechatronics	Theoretical and practical application of modern measurement techniques in mechatronics. Work in a graphical control and measurement environment (individual work with National Instruments DAQ cards); selected non-invasive techniques (Motion Capture basics); compression, transmission and synchronization of measurement data; practice of using microcontrollers.								
22	Logic and Digital Systems	Fundamentals of digital information representation, Boolean algebra, and logical function minimization. Digital elements and modules, combinational and sequential circuits. Hazard analysis and state coding principles. Programmable logic circuits, memories, and basics of microprogramming.	x			x				
23	Fundamentals of Robotics	Types of robots - their characteristics and main components. Robot kinematics. Methods for describing the position and orientation of rigid bodies. Composition of translations and rotations. Homogeneous transformations, Denavit-Hartenberg notation. Forward and inverse kinematics for effector positions and orientations. Analytic and geometric Jacobian of a manipulator, angular velocity and linear velocity. Jacobian singularities and singular configurations. Forward and inverse kinematics for velocity. Manipulator dynamics. Lagrange formalism. Euler-Lagrange equations and their use in modeling manipulator dynamics.	x							
24	Signals and Dynamic Systems	Continuous and discrete-time signals. Operator calculus (Laplace and Z transforms) for investigating signal properties. Signal operations. Modeling linear dynamic systems using differential equations, operator transfer functions, and state variables. Analysis of the properties of linear dynamic systems. Designing systems with given properties.	x		x	x				
25	English B2 module II	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 2						x		x
26	English B2+ module II	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 2						x		x
27	German B2 module II	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 2						x		x
28	English C1 module II	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 2						x		x

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
29	Social and Legal Aspects of Robotics and Automation	Definition of social issues and the role of automation and robotics in society. Analysis of the impact of modern technologies (robotics, AI) on significant contemporary problems. Engineering ethics and responsibility. Intellectual property law: copyright and industrial property protection (patents, trademarks). Technology transfer, academic entrepreneurship, incubators, and small business support policies.		x						x
30	Starting and Running a Business	A start-up concept from a selected industry. Developing the idea requires the use of BMC (Business Model Canvas), LC (Lean Canvas), and VPC (Value Proposition Canvas) tools. Analysis of the business environment. Introduction to the principles of establishing and running a business in Poland, with particular emphasis on: (1) The procedures for registering a business in Poland, including differences and similarities resulting from the use of various organizational and legal forms. (2) Analyzing the business environment and building relationships with customers and suppliers. (3) Managing accounting and tax settlements related to income tax and VAT. (4) Hiring employees and individuals under civil law contracts, calculating wages and social security contributions (ZUS), as well as reporting obligations to tax authorities and ZUS.		x						x
31	Computer-Aided Design of Electrical Installations and Machines (CAD)	A comprehensive introduction to the principles of creating electrical schematics, electrical device symbolism, and working in SeeElectrical, along with practical skills in project development, using electrical apparatus catalogs, building custom device libraries and schematics, as well as topics related to the methodology of computer-aided modeling of solid and surface objects, performing and analyzing 3D assemblies, and methods of creating technical documentation in the Inventor system.	x			x				
32	Object-Oriented Programming in Automatics	Basic principles of object-oriented programming. Elements of the C++ (Qt) and Java languages: classes, fields and methods, operator overloading, inheritance, virtual functions and class hierarchies. Access control for class members, encapsulation and access modifiers. Exception handling and basic error-handling mechanisms. Input and output streams and the use of standard libraries (STL). Introduction to design patterns and to software design and project management methodologies. Development of programs in Java: defining classes and interfaces, using multidimensional arrays, handling input/output streams and using selected classes from standard libraries. Program debugging in IDE environments and with the jdb tool. Development of window-based applications in the Qt Creator environment using the Qt framework. Signals and slots mechanism, use of standard GUI components and text files for data storage. Implementation of programs using concepts presented during the lectures.	x			x				
33	Manufacturing Technologies	Discussion and identification of basic manufacturing technology processes, along with explaining the phenomena occurring during these processes. Analysis of the influence of key technological parameters on the operational properties of products and the ability to select these parameters. Fundamental technological calculations. Conducting simple technological tests, processing the results, and critically evaluating their quality.	x			x				
34	Sensory and Special Materials	Basic physical properties of materials: electronic structure, electrical conductivity, and thermal and electromagnetic properties. Classification of electrical and electronic materials and identification of their sensory properties. Conductive materials: metals, composites and special materials, including thin-film, transparent and flexible conductors, nanowires, graphene and conductive polymers. Superconductors – properties, parameters, technologies and cryogenic systems. Semiconductors, dielectrics and magnetic materials – material characteristics, manufacturing technologies and applications. Materials used in unconventional energy sources. Materials engineering technologies: electron, laser, plasma and vacuum technologies, microelectronics, nanotechnologies, nanomaterials and 3D printing. Investigation of electrical and sensory properties of various classes of materials. Analysis of materials used in sensors of physical quantities and in textronic elements. Introduction to thin-film technologies and research on materials for unconventional energy sources.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
35	Structural Design Essentials	Basic knowledge and skills in the field of construction materials, strength of materials, machine standards, and design and manufacturing techniques, with particular emphasis on applications in automation and robotics for students of non-mechanical studies.	x			x				
36	What Is the Essence of Automatic Control	The course presents the fundamental principles of the operation of automation systems and the components used in control processes. The laboratory component includes practical exercises focused on designing simple automation systems. Additionally, the course involves the development and testing of original control algorithms for both real and simulated objects.	x			x				
37	Analog and Digital Control Systems	Fundamentals of electronic components used in automation, including linear and nonlinear systems with operational amplifiers, and components such as comparators, optocouplers, and relay circuits. Practical aspects of using digital and microprocessor systems, as well as power switches. Voltage and current analysis of systems.	x		x	x		x		
38	Electromechanical Converters	The design and operation of DC and AC transformers and electrical machines. Steady-state analysis using circuit methods and fundamental equations of electromagnetic field theory. Powering machines with power electronic converters.	x			x				
39	Microprocessor Technology	The structure and programming methods of microprocessor systems. Microcontrollers used in embedded control systems. Typical central processing units and peripherals. Low-level and high-level microcontroller programming.	x		x	x				
40	Automation and Control	Description of continuous- and discrete-time automatic control systems using models employing transfer functions and state variables. Control objectives and evaluation of control systems. Design of control systems using frequency-based and state-variable methods. Tuning of controllers. Implementation of control systems in real-world conditions.	x		x	x				
41	Control of Robots	Manipulator movements and its dynamics. Planning a desired trajectory. Robot drives, their dynamics, and control. Sensors used in robotics. Robot programming methods. Positional control methods for manipulators. Positional-force control of manipulators. Basics of compliant and impedance control.	x		x	x		x		
42	Programmable Logic Controllers	Basic information about Programmable Logic Controllers. Construction of programmable controllers. Operating principle of controllers. General aspects of creating application software for industrial control systems. Programming languages and methods. Examples of controller programming using ladder diagram and structured text languages.	x			x				
43	Pneumatic and Hydraulic Drives	Topics related to the application of pneumatics and hydraulics in machine and equipment drives, including the construction and operation of pneumatic and hydrostatic systems, control elements, schematic design principles, as well as methods for simulating and analyzing system performance.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
44	Microautomation	An introduction to modern micro-automation techniques, with particular emphasis on logic systems, digital systems, and microsystems. The course covers the fundamentals of technical logic, Boolean algebra, synthesis methods, and the physical implementations of logic circuits, including combinational and sequential systems. It also presents the structure, technologies, and operating principles of integrated circuits, as well as the process of designing and manufacturing printed circuit boards (PCBs). A key component of the course is an introduction to MEMS technology, covering fabrication methods, applications, and examples of microsensors and microactuators used in automation and electronics. Additionally, the course discusses human-machine interface (HMI) design and principles for creating ergonomic control systems. The laboratory component is practical in nature and includes modeling finite state machines, analyzing the dynamics of systems with control elements, investigating undesired phenomena (such as hazards and contact bounce), and controlling stepper motors. Students also develop an interface project and implement communication with a microcontroller in the Unity environment, integrating concepts from electronics, control, and programming.	x			x				
45	Creating Robotic Systems	Introduction to modern robotic systems and ROS. Communication patterns in robotic systems: Publish/Subscribe, Client/Server (Service), Parameter Server. Robot interface construction. Robot visualization. Tools for computation and data archiving. Robot simulation and data collection	x			x				
46	English B2 module III	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate.					x		x	
47	English B2+ module III	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 3					x		x	
48	German B2 module III	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 3					x		x	
49	English C1 module III	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 3					x		x	
50	Fundamentals of Power Electronics	Power electronics - basic concepts, converter types. Semiconductor power devices. Commutation phenomenon. Single and three phase rectifiers. Single and three phase AC power controllers. Direct frequency converters. Power converter for a DC motor. DCDC switching power supply. Voltage and current inverters.	x		x	x				
51	Robotics Programming Laboratory	In this laboratory, students learn to program industrial robots using various programming methods. The industrial robots programmed by students have various kinematic chains and their own dedicated programming environments.	x			x		x		
52	Programming of Industrial Robots	Trajectory planning for robots with different kinematic unit structures, robot cooperation with external devices, input/output support	x			x		x		

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
53	Automation and Control Laboratory	Understanding the properties and implementation of discrete PID controllers. Creating an approximate mathematical model of a control plant based on a step response. Understanding the properties of continuous PID controllers - various implementation methods. Designing linear system observers and their use in a control system. The pole placement method and its implementation. Linearization and its use in the control of nonlinear systems. Using disturbance compensation in PID controller systems. Designing linear control systems using frequency methods. Tuning PID controllers in industrial controllers. Implementing control algorithms using control and measurement cards.	x			x		x		
54	Mechatronics Control Laboratory	The laboratory covers fundamental aspects of analysis, design, and implementation of control systems in mechatronic applications. Students perform experiments in continuous and discrete control, analysis of dynamic system responses, and control of drives and selected physical processes. The classes are conducted on real, multidisciplinary laboratory setups integrating mechanical, electronic, and software components. The course also includes programming and implementation of control systems using microcontrollers, PLCs, and programmable digital devices.	x			x		x		
55	Electronic Control Systems	Structures and principles of operation of automatic control systems. Design and study of practical systems composed of electronic components such as operational amplifiers and transistors, as well as the study of complex control structures. Life-cycle analysis.	x	x		x		x		
56	Data Base Systems Design	Analysis of business needs and IT system design goals. Data model and database structure, entities, attributes, and dependencies, and relational schema. Design using learned database system design methods. Database implementation in the selected database management system. Database testing.	x			x	x			
57	English B2 module IV	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 4. Egzam.					x		x	
58	English B2+ module IV	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 4. Egzam.					x		x	
59	German B2 module IV	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 4. Egzam.					x		x	
60	English C1 module IV	Selected lexical and grammatical issues and linguistic topics and contexts characteristic of the learning and work environment of a university graduate. Module 4. Egzam.					x		x	
61	Vision Systems	Lecture topics: Vision system components. Basic methods of processing vision information for robotics. Image data structures. Color models. Basic image operations. Robotic scene image segmentation. Object localization in a robotic scene. Shape analysis. The laboratory includes a series of problem-solving exercises illustrating the lecture topics.	x			x				
62	Real-Time Systems	Basic characteristics of real-time systems in control systems. Gradual degradation, safe state, and operational reliability. Discussion of selected practical real-time system solutions. Software testing, system performance evaluation, and further software development. The importance of good documentation.								

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
63	Algorithms and DSP Systems in Automatics	This course covers the application of digital signal processing theory to the implementation of discrete control structures and measurement signal processing (FIR filters, IIR filters, median filter). The material covers chosen central processing units based on DSP cores and the implementation of DSP algorithms in a dedicated microprocessor system.	x			x				
64	Documentation of Industrial Automation Systems	Principles of preparing electrical schematics for machines and industrial automation equipment. Current standards and legal regulations concerning electrical documentation. Basic graphical symbols used in automation design. Safety of machines and equipment and principles of reading and interpreting electrical diagrams. Introduction to SEE Electrical software and its basic and advanced functions. Use of symbols with function and location attributes and creation of PLC controller libraries. Generation of documentation lists: equipment, wires and terminal blocks. Introduction to the "2D Panel Layout" module. Development of documentation projects in SEE Electrical: sheet templates, component symbols, use of electrical equipment catalogues and catalogue codes. Preparation of electrical schematics for selected devices and generation of documentation lists. Design of component layout in an electrical cabinet based on the prepared schematic.	x			x				
65	Hardware Description Languages (HDL)	Hardware Description Languages (HDL) is a course dedicated to the design and description of digital logic circuits using hardware description languages. The aim of the course is to familiarize students with methods of modeling, simulation, and synthesis of circuits intended for implementation in programmable logic devices. During the course, students learn fundamental concepts of designing combinational and sequential systems, structural and behavioral descriptions of digital systems, and selected aspects of verification of designed solutions. The laboratory component includes practical projects that develop the ability to independently design and test digital circuits using contemporary design tools.	x			x				
66	Java Applications	This course covers the fundamentals of Java and object-oriented programming—types, variables, control statements, classes and interfaces, inheritance, encapsulation, exceptions, I/O streams, design patterns, and using APIs and creating GUIs. Labs focus on hands-on exercises: defining classes and interfaces, debugging (JDB, IDE), multithreaded programming, creating GUIs, and accessing databases using JDBC and ORM.	x			x				
67	Feeders, Magazines and Transporters	Devices for storage and transportation. Orientation, manipulation and dispensing of the workpieces	x			x				
68	Competence Project	Analysis and solution of the presented problem, presentation of results, free selection of methods and tools. Project management issues: planning, monitoring, team coordination, resource management and communication. The project serves as a summative module.	x		x		x	x	x	
69	Microprocessor Systems Software Development	Creating functional software for microprocessor systems used in control systems and consumer devices. Programming in high-level languages using intermediate layers in the form of specialized APIs and dedicated operating systems.	x		x	x				
70	Fundamentals of Electrical Drives	Elements and basic features of drive system. Drive systems operating modes. Drive systems dynamics and graphical approach for its analysis. Properties of mechanical systems. Determining of the equivalent torque and load parameters referred to the motor shaft. Basic speed control methods properties and drive starting methods. Electrical drive braking - method and analysis with motor and load curves.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
71	Mobile Robots	Basic concepts related to mobile robots (types and example designs, kinematic description of wheeled robots and its use in simulation, principles of motion, localization, and navigation algorithms for mobile robots). Selection of the structure and component set of a mobile robot from the perspective of a specific application. Programming and testing of fundamental robot functions (including those related to motion, localization, and navigation).	x		x	x				
72	Supervisory Control and Data Acquisition Systems	Basic information on the design and operation of industrial process visualization and supervision systems. A layered model of industrial processes. A standard for connecting devices and software. Programming tools for preparing and editing SCADA system components. A process database for enterprise control and management. Data security and SCADA system user authentication.	x			x				
73	Pneumatic and Hydraulic Automation Equipment	Topics related to the application of pneumatics and hydraulics in machine and equipment drives, including the construction and operation of pneumatic and hydrostatic systems, control elements, schematic design principles, as well as methods for simulating and analyzing system performance.								
74	Industrial Measurements with Certificate Up to 1 kV	A practice-oriented engineering course focused on measurement techniques for electrical and non-electrical quantities and on the evaluation of electric shock protection in electrical installations and equipment. Students develop competencies in selecting appropriate measurement methods, performing measurements in real operating systems, and processing and interpreting results, including the preparation of technical measurement documentation. The course covers industrial sensors and transducers, measurement instrumentation, and data analysis methods, as well as principles of safe operation of electrical equipment, including protective measures against electric shock and methods for assessing their effectiveness. The acquired knowledge and skills are directly applicable in the operation and maintenance of electrical installations and industrial automation systems, as well as in the preparation of technical and operational documentation. The course also provides a solid foundation for pursuing professional qualifications in the field of electrical installations.	x			x				
75	Electronic Equipment Design	Basic principles of designing integrated automation systems implemented as SoC, MCM, SiP, IPM and IIS modules. Environmental stresses affecting electronic equipment, including electromagnetic compatibility and basic reliability issues. Thin- and thick-film materials and technologies and hybrid circuits. Thermal aspects in electronic equipment design: placement of heat-dissipating components, natural and forced cooling methods, selection of heat sinks and active cooling systems. Technologies used in the assembly of electronic equipment: contact and interconnection elements, wiring, and THT and SMT technologies. Measurement and inspection methods used in the assembly of electronic circuits. Design of electronic circuits in a CAD environment (Altium Designer). Assembly of selected electronic circuits using SMT technology and performing measurement and inspection tests verifying correct assembly and operation of the system.								
76	Automatics Laboratory	The module covers issues related to the practical implementation and testing of industrial and home automation systems. The course introduces the fundamental principles of designing automatic control systems, taking into account the physical constraints present in real installations. The program also includes a discussion of innovative methods for fostering interest in developing custom devices equipped with basic automation modules.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
77	Computer Simulation of Control Systems	The aim of the course is to familiarize students with modern tools and methods for modeling, analyzing, and designing electronic and automation systems using the OrCAD/PSPICE A/D environment. Students learn both the theoretical foundations of computer simulations and the practical aspects of preparing schematics, defining component models, and selecting appropriate types of analyses. The course covers the principles of working with the Capture, Model Editor, ABM, and Probe modules, as well as various methods of circuit analysis, including transient analysis, DC analysis, AC analysis, noise analysis, and Monte Carlo analysis.	x			x				
78	Decision Making Support and Artificial Intelligence Methods	Artificial neural networks: classification, approximation, modeling, and control using neural networks. Fuzzy modeling and control. Evolutionary algorithms. Optimization of control system parameters.	x			x				
79	Network Applications	Network Applications is a practice-oriented course aimed at familiarizing students with the design, implementation, and deployment of applications operating in a networked environment. As part of the course, students complete a team-based project involving the development of a complete IT solution based on communication between system components. The course covers topics related to distributed application architectures, integration with external systems, and cooperation with data storage systems. Students gain knowledge of fundamental network communication mechanisms as well as selected aspects of ensuring reliability, security, and scalability of developed solutions. The course emphasizes the development of practical skills and teamwork using contemporary software engineering tools.	x			x				
80	Advanced Industrial Robot Programming	Programming industrial robots using vision systems, with force feedback systems.	x			x				
81	Programming of Computerized Numerical Control Machine Tools	Designing technological processes for CNC machines. Programming of numerically controlled lathes. Programming of numerically controlled milling machines. Principles of selecting machining parameters.	x			x				
82	Diploma Seminar	Methodology of research work, rules of writing a thesis and preparation for the presentation of its results, preparation for the defense of the thesis. A competency exam checking knowledge and aggregated skills.						x	x	
83	Final Project	Preparation of an engineering thesis, including elements of a practical solution, in accordance with the guidelines adopted by the RKS.	x			x	x		x	x
84	Internship	Gaining practical knowledge and new professional competences in natural workplace conditions.		x				x	x	x
85	Interfaces in Microprocessor Systems	The course provides practical insight into the most important low-level communication protocols used in microprocessor systems, such as 1-Wire, I ² C, SPI, LIN, UART, USB, and CAN. Students learn the operating principles of these interfaces, their implementation in processors, and their typical applications in electronics and automation. The course also covers handling peripheral devices, including serial memories, A/D converters, and various types of sensors. Additionally, it introduces high-level communication protocols such as MODBUS and CANopen, with an analysis of their structure and data-exchange mechanisms. The acquired knowledge enables students to design and analyze communication systems used in modern microprocessor-based devices.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
86	Automatics of Electrical Drives	Space vector: definition and basic properties, transformation of vector equations into various coordinate systems. Space vector model of AC motor. Field oriented control (FOC). Direct torque control (DTC). Space vector based pulse width modulation. Automated systems for starting induction motors. Settings selection and adjusting for starting systems and inverters.	x			x				
87	Automation and Measurements in a Power Plant	A power plant as a multidimensional control object. Characteristics of the basic technological processes subject to control in a power plant. Basic automatic control systems used in power plants. Types and measurement ranges of instruments used in power plants. Classification of instruments and measurement methods.	x			x				
88	Data Protection	The concept of a cipher. Historical examples of substitution ciphers. Symmetric and asymmetric cryptography. Block cipher algorithms, with emphasis on AES. Basics of modular arithmetic and the RSA cryptosystem. Elliptic curve cryptography (ECC) over finite fields. The concept of a hash function and its importance in cryptography. Examples of modern hash functions. Elements of cryptanalysis.	x			x				
89	Production Control Methods and Systems	Fundamentals of operations research and its role in modern production management. Methods for optimizing production decisions, including mathematical programming. Analysis, modeling, and planning of technological processes. Use of modern IT methods and machine learning for decision support in production systems.	x			x				
90	Application of PLC Controllers in Industrial Systems	The module covers the applications of programmable controllers and their use in industrial settings, including the limitations associated with their implementation. The course discusses hardware-related issues concerning the installation of PLCs in automation systems. It also addresses topics related to the development of control algorithms.	x			x				
91	Graphical Programming of Controllers	Programming in Simulink and LabVIEW. As part of the laboratory course, students complete six exercises during which they implement control of real physical systems such as: 3-DoF crane system, 2-DoF helicopter model, magnetic levitation system, inverted pendulum, thermal chamber, DC motor, using dS1104 and DS1006 processor boards as well as the myRIO controller. Control algorithms are implemented in the LabVIEW and MATLAB/Simulink programming environments.	x			x				
92	Autonomous Robots	Introduction to autonomous robots, robotics paradigms. Signal fusion-based localization. Robot navigation. Robot architectures, action planning. Cognitive systems. Autonomous robot interfaces.	x			x				
93	Offline Robots Programming	Configuration of a robotic workstation in offline mode. Offline programming of a robotic workstation, including integration of peripheral devices.	x			x				
94	Medical Robots	Overview of the applications of robots in medicine and characteristics of selected robotic systems used in surgery and rehabilitation. Structure and operating principles of medical robots based on examples of the Zeus, da Vinci and RobIn Heart systems. The process of designing and constructing medical robots and limitations resulting from medical device requirements. Development trends in medical robotics. Analysis of the structure and operating principles of the RobIn Heart robot. Design of a selected subsystem of a medical or rehabilitation robot.								
95	Reverse Engineering and 3D Printing	The course content includes topics related to reverse engineering concerning the creation of 3D object models using coordinate measuring techniques and 3D scanning. It also covers content related to the use of 3D printers for additive prototype production.	x			x				

No.	Course name	Program content	1ASR1	1ASR2	1ASR3	1ASR4	1ASR5	1ASR6	1ASR7	1ASR8
96	Elective Project	Continuation of the engineering project	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 I	3				
3	Electric Circuits I	5			5	
4	Statics and Kinematics	5				
5	First CS Project	5		5		
6	Contemporary Engineering, Safety, and Standardization	2				
7	Engineering Drawing	2				
8	Mathematics II	6				
9	Information Technology	4			4	
10	Electric Circuits II	4			4	
11	Physics II: Dynamics & Mechanical Systems	5				
12	Fundamentals of Electronics	3			3	
13	Computer Architecture and Operating Systems	3				
14	English B2 module I	2		2		
15	English B2+ module I	2		2		
16	German B2 module I	2		2		
17	English C1 module I	2		2		
18	Metrology	3			3	
19	Numerical Methods	4			4	
20	Computer Measurement Systems in Automatics	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	Measurement Techniques in Mechatronics	2		2		
22	Logic and Digital Systems	4			4	
23	Fundamentals of Robotics	4			4	
24	Signals and Dynamic Systems	5			5	
25	English B2 module II	2		2		
26	English B2+ module II	2		2		
27	German B2 module II	2		2		
28	English C1 module II	2		2		
29	Social and Legal Aspects of Robotics and Automation	5		5		
30	Starting and Running a Business	5		5		
31	Computer-Aided Design of Electrical Installations and Machines (CAD)	4		4		
32	Object-Oriented Programming in Automatics	4		4		
33	Manufacturing Technologies	4		4		
34	Sensory and Special Materials	4		4		
35	Structural Design Essentials	4		4		
36	What Is the Essence of Automatic Control	4		4		
37	Analog and Digital Control Systems	5			5	
38	Electromechanical Converters	4			4	
39	Microprocessor Technology	5			5	
40	Automation and Control	5			5	
41	Control of Robots	4			4	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
42	Programmable Logic Controllers	3			3	
43	Pneumatic and Hydraulic Drives	2		2		
44	Microautomation	2		2		
45	Creating Robotic Systems	2		2		
46	English B2 module III	2		2		
47	English B2+ module III	2		2		
48	German B2 module III	2		2		
49	English C1 module III	2		2		
50	Fundamentals of Power Electronics	5			5	
51	Robotics Programming Laboratory	3		3		
52	Programming of Industrial Robots	3		3		
53	Automation and Control Laboratory	3		3	3	
54	Mechatronics Control Laboratory	3		3	3	
55	Electronic Control Systems	7			7	
56	Data Base Systems Design	3			3	3
57	English B2 module IV	3		3		
58	English B2+ module IV	3		3		
59	German B2 module IV	3		3		
60	English C1 module IV	3		3		
61	Vision Systems	3		3	3	
62	Real-Time Systems	3		3	3	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
63	Algorithms and DSP Systems in Automatics	3		3	3	
64	Documentation of Industrial Automation Systems	3		3	3	
65	Hardware Description Languages (HDL)	3		3	3	
66	Java Applications	3		3	3	
67	Feeders, Magazines and Transporters	3		3	3	
68	Competence Project	7			7	
69	Microprocessor Systems Software Development	4			4	
70	Fundamentals of Electrical Drives	4			4	
71	Mobile Robots	4			4	
72	Supervisory Control and Data Acquisition Systems	3			3	
73	Pneumatic and Hydraulic Automation Equipment	4		4		
74	Industrial Measurements with Certificate Up to 1 kV	4		4		
75	Electronic Equipment Design	4		4		
76	Automatics Laboratory	4		4		
77	Computer Simulation of Control Systems	4		4		
78	Decision Making Support and Artificial Intelligence Methods	4		4		
79	Network Applications	4		4		
80	Advanced Industrial Robot Programming	4		4	4	
81	Programming of Computerized Numerical Control Machine Tools	4		4		
82	Diploma Seminar	3			3	
83	Final Project	15		15	15	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
84	Internship	6				
85	Interfaces in Microprocessor Systems	2		2		
86	Automatics of Electrical Drives	2		2		
87	Automation and Measurements in a Power Plant	2		2		
88	Data Protection	2		2		
89	Production Control Methods and Systems	2		2		
90	Application of PLC Controllers in Industrial Systems	2		2		
91	Graphical Programming of Controllers	2		2		
92	Autonomous Robots	2		2		
93	Offline Robots Programming	2		2		
94	Medical Robots	2		2		
95	Reverse Engineering and 3D Printing	2		2		
96	Elective Project	2		2		

ECTS indicators

Name	Value
The total number of ECTS credits that a student must obtain through elective courses (amounting to no less than 30% of the total ECTS credits required to obtain the qualification corresponding to the given level of study)	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	126.89/210 (60.42%)

Methods of verifying and assessing learning outcomes

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

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

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

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

Professional internships

Duration: 6 weeks

ECTS credits: 6

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

Characteristics of the course

Graduate profile

Graduate of the Automation and Robot Control (AiSR) program acquires knowledge and skills enabling them to solve problems occurring in the control of various devices and technological processes. They are able to effectively use mathematical methods for modeling, digital simulation, and designing control systems. They are prepared to commission automatic control and supervision systems using computer systems, microprocessor controllers, programmable logic controllers, robots, and other contemporary technologies.

The graduate possesses skills in designing systems that require the use of industrial computer networks and real time operating software. They can program industrial robots as well as design and program mobile, medical, and rehabilitation robots. They have broad IT competencies, the ability to independently program in various technologies, and the capability to creatively use software in automation. The graduate can obtain professional certificates granting appropriate qualifications for engineering work.

The intended professional sectors in which the graduate may find employment include: industrial automation, robotics, energy, transport, industrial process control, and control systems, which are ubiquitous across all branches of industry. AiSR graduates can work in professions such as maintenance engineer, automation engineer, robotics engineer, automation systems designer, IT systems designer, and can also run engineering businesses of their own.

Graduates are prepared to undertake second cycle studies in automation and robotics as well as related fields. First cycle studies in Automation and Robot Control (AiSR) provide the graduate with in depth knowledge, inspiration, and familiarity with techniques that they will creatively apply in their further professional development. The program prepares graduates to solve new engineering problems in automation and robotics.

The curriculum ensures a balance between courses presenting theoretical foundations of control and those introducing contemporary technologies and advanced skills used in industrial practice. Students gain hands on experience with modern automation and robotics technologies and devices, and create their own technical solutions. Thanks to a wide range of elective courses, the program allows students to shape their educational pathway according to their own predispositions and career plans. The intended professional sectors in which the graduate may find employment include, among others: industrial automation, robotics, energy, transport, logistics, industrial process control, and control systems.

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

The Automation and Robot Control program is a continuation of the Automation and Robotics program, which has been offered at the EEIA Faculty of Lodz University of Technology for 30 years. The program's assumptions—above all the practice of its implementation, monitored by the RKS—ensure that all goals of the 'Development Strategy of Lodz University of Technology for 2025–2030' listed in the Education section are met.

General goal:

Development of an education model for students and doctoral candidates that prepares graduates for the dynamically changing needs of the socio economic environment.

Specific goals:

1. Continuous improvement of academic teachers' competencies in modern teaching methods, current knowledge, technological development, and scientific trends – through ensuring that courses are taught by specialists conducting research in the discipline, engaged in projects, actively publishing, participating in organizations, conferences, and other international bodies, and by supporting such activities of staff.
2. Enhancing the educational offer, including supplementary forms of education, in response to the challenges of the socio economic environment – through ongoing contact with the socio economic environment, inspiring joint projects, introducing new forms of teaching, and promoting such activities among staff.
3. Strengthening talent management through the individualization of educational pathways for students and doctoral candidates – by seeking engaged candidates for studies, providing individual supervision during project implementation, and supporting the activities of student research groups.
4. Supporting the scientific development of students and doctoral candidates with consideration of interdisciplinarity and internationalization – through engaging visiting professors from renowned universities and implementing interdisciplinary projects within the study program.
5. Increasing student involvement in research conducted at the University and intensifying the acquisition of practical experience outside the University – through individual supervision of students involved in research at the Institute, supporting student

publications, and creating equipment resources available to students for project implementation.

The program is also strongly aligned with other goals included in the 'Development Strategy of Lodz University of Technology for 2025–2030', for example in the areas of:

- impact on the socio economic environment (IMPACT);
- internationalization (INTERNATIONALIZATION);
- innovation and technology transfer (INNOVATION);
- science (SCIENCE);
- infrastructure (INFRASTRUCTURE);
- talents (TALENTS);
- sustainability (SUSTAINABILITY);
- students (STUDENTS).

The program is also consistent with the plans defined in the document 'Long Term Strategic Vision for the Development of Lodz University of Technology for 2025–2050' (Draft "2"). The program structure is prepared for future implementation of recommendations listed in the section 'Education Program of the Future and Modern Teaching Models'. The content of the program directly corresponds to the recommendations defined in the section 'Digital Technologies, Artificial Intelligence, and Industrial Transformation', and direct equivalents of the curriculum components can be found in the sections 'Robotics, digitalization, and decarbonization of manufacturing processes' and 'Integration of Digital Twins in engineering programs'.

Educational objectives and employment and continuing education opportunities

First cycle studies provide the graduate with fundamental engineering knowledge as well as inspiration and techniques that can be creatively applied in further professional development. The study program ensures a balance between theoretical courses and courses presenting technologies and advanced skills that are already useful in both Polish and international industrial practice. Graduates acquire up to date knowledge in the following areas:

- a) Digital control and industrial automation.
- b) Design of continuous and discrete control systems.
- c) Robot control.
- d) IT tools for automation and robotics.

Thanks to a wide range of elective courses, the program allows students to shape their educational pathway according to their own predispositions and interests.

The intended professional sectors in which graduates may find employment include: industrial automation, robotics, energy, transport, industrial process control, and control systems, which are ubiquitous across all branches of industry. Graduates of the Automation and Robot Control program can work in professions such as: maintenance engineer, automation engineer, robotics engineer, automation systems designer, IT systems designer, and they may also run engineering businesses of their own.

Graduates are prepared to undertake second cycle studies in the disciplines of automation, electronics, electrical engineering, space technologies, as well as related fields.

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

The proposed modifications implement Resolution No. 24/2025 of the Senate of Lodz University of Technology of 26 February 2025 on guidelines for Study Program Councils regarding the creation and improvement of study program designs.

Experience gained from cooperation with employers during the previous implementation of the Automation and Robot Control program at the EEIA Faculty of Lodz University of Technology, as well as research on the career paths of its graduates, confirms the assumption of continuing the adopted educational approach. The Institute of Automatic Control at Lodz University of Technology, which is the leading unit running the program, has signed dozens of cooperation agreements with companies of various sizes and continuously monitors employer needs. Numerous diploma theses are carried out at the initiative of and in collaboration with the employers of our students and graduates. In recent years, many industry representatives have participated in presentations of competency projects during the 6th semester of full time studies. This forum provided an opportunity to discuss employers' expectations regarding key graduate competencies and allowed students to select practical project topics. Representatives of the RKS remain in constant contact with companies of various profiles and sizes: manufacturing, integration, large enterprises, and family businesses (e.g. Lamela Sp. z o.o.

Sp.k., Aret Sp. z o.o. Sp.k., ABB Sp. z o.o., HetBot Sp. z o.o., BSH Household Appliances Sp. z o.o., Corning Optical Communications Polska Sp. z o.o., Zemat Technology Group Sp. z o.o.). Several of these companies have provided written opinions on the proposed modifications and their overall impressions of the Automation and Robot Control program. Corning highlighted the alignment between the Institute's research areas and the graduate profile with the company's operations and needs. Zemat emphasized the Council's appropriate response to current needs in the automation and robotics industry and also pointed out the need to strengthen issues related to safety and design in accordance with standards and directives—elements which we have incorporated into several courses in the modified curriculum. All partners underline the importance of mastering the theoretical foundations of automation, developing the ability to independently expand one's knowledge, creatively applying various industrial automation devices, programming in selected technologies and learning new ones, producing and analyzing technical documentation, using information sources, working in teams, utilizing digital resources, and possessing strong language skills.

Conclusions from the comprehensive "Employer Opinions Survey on Graduates of Lodz University of Technology," systematically conducted with the participation of many companies representing diverse sectors of the economy, were also used in the modification of the program.

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

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

The unit organizing education

Faculty of Electrical, Electronic, Computer and Control Engineering

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mathematics I	Tutorials: 90 Lecture: 30	8	Exam	Obligatory
Physics I	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
Electric Circuits I	Tutorials: 15 Lecture: 30	5	Graded assignment	Obligatory
Statics and Kinematics	Tutorials: 20 Lecture: 30	5	Graded assignment	Obligatory
First CS Project	Project work: 45 Lecture: 15	5	Graded assignment	Obligatory subjects to choose from
Contemporary Engineering, Safety, and Standardization	Lecture: 30	2	Graded assignment	Obligatory
Engineering Drawing	Laboratory classes: 30	2	Graded assignment	Obligatory
Sum	365	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mathematics II	Tutorials: 45 Lecture: 45	6	Exam	Obligatory
Information Technology	Laboratory classes: 45 E-learning: 15	4	Graded assignment	Obligatory
Electric Circuits II	Tutorials: 15 Lecture: 30	4	Graded assignment	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physics II: Dynamics & Mechanical Systems	Tutorials: 15 Laboratory classes: 40 Lecture: 15	5	Exam	Obligatory
Fundamentals of Electronics	Laboratory classes: 20 Lecture: 15	3	Graded assignment	Obligatory
Computer Architecture and Operating Systems	Laboratory classes: 15 Lecture: 15	3	Graded assignment	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
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
Metrology	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Physical Education 1	Tutorials: 30	0	Pass	Obligatory
Sum	435	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Nummerical Methods	Tutorials: 15 Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Elective Courses 1		2	Graded assignment	Obligatory group
The student chooses 1 subject				

Course	Number of hours	ECTS points	Form of verification	Obligatory
Computer Measurement Systems in Automatics	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Measurement Techniques in Mechatronics	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Logic and Digital Systems	Tutorials: 15 Lecture: 30	4	Exam	Obligatory
Fundamentals of Robotics	Tutorials: 30 Lecture: 30	4	Exam	Obligatory
Signals and Dynamic Systems	Laboratory classes: 15 Project work: 30 Lecture: 30	5	Exam	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
German B2 module II	Tutorials: 30	2	Graded assignment	Optional
English C1 module II	Tutorials: 30	2	Graded assignment	Optional
Elective Humanities Courses		5	Graded assignment	Obligatory group
The student chooses 1 subject				
Social and Legal Aspects of Robotics and Automation	Tutorials: 35 Lecture: 15	5	Graded assignment	Optional
Starting and Running a Business	Tutorials: 20 Project work: 15 Lecture: 15	5	Graded assignment	Optional
Elective Courses 2		4	Graded assignment	Obligatory group
The student chooses 1 subject				
Computer-Aided Design of Electrical Installations and Machines (CAD)	Laboratory classes: 50 Lecture: 10	4	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Object-Oriented Programming in Automatics	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Optional
Manufacturing Technologies	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Optional
Sensory and Special Materials	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Optional
Structural Design Essentials	Seminar: 20 Project work: 40	4	Graded assignment	Optional
What Is the Essence of Automatic Control	Laboratory classes: 45 Lecture: 15	4	Graded assignment	Optional
Physical Education 2	Tutorials: 30	0	Pass	Obligatory
Sum	440	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Analog and Digital Control Systems	Tutorials: 15 Laboratory classes: 30 Lecture: 30	5	Graded assignment	Obligatory
Electromechanical Converters	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Microprocessor Technology	Laboratory classes: 45 Lecture: 30	5	Graded assignment	Obligatory
Automation and Control	Project work: 30 Lecture: 45	5	Exam	Obligatory
Control of Robots	Laboratory classes: 15 Lecture: 30	4	Exam	Obligatory
Programmable Logic Controllers	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Elective Courses 3		2	Graded assignment	Obligatory group
The student chooses 1 subject				
Pneumatic and Hydraulic Drives	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Microautomation	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Creating Robotic Systems	Laboratory classes: 15 Project work: 15	2	Graded assignment	Optional
Foreign Language Module 3		2	Graded assignment	Obligatory group
The student chooses 1 module				
English B2 module III	Tutorials: 30	2	Graded assignment	Optional
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
Sum	435	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Fundamentals of Power Electronics	Laboratory classes: 30 Lecture: 30	5	Exam	Obligatory
Elective Courses 4		3	Graded assignment	Obligatory group
The student chooses 1 subject				
Robotics Programming Laboratory	Laboratory classes: 45	3	Graded assignment	Optional
Programming of Industrial Robots	Laboratory classes: 45	3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Elective Course 5		3	Graded assignment	Obligatory group
The student chooses 1 subject				
Automation and Control Laboratory	Laboratory classes: 45	3	Graded assignment	Optional
Mechatronics Control Laboratory	Laboratory classes: 45	3	Graded assignment	Optional
Electronic Control Systems	Laboratory classes: 60 Project work: 15 Lecture: 15	7	Exam	Obligatory
Data Base Systems Design	Laboratory classes: 15 Lecture: 15	3	Exam	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
Elective Courses 6		6	Graded assignment	Obligatory group
The student chooses 2 subjects				
Vision Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Real-Time Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Algorithms and DSP Systems in Automatics	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Documentation of Industrial Automation Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Hardware Description Languages (HDL)	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Java Applications	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Feeders, Magazines and Transporters	Laboratory classes: 10 Project work: 20 Lecture: 15	3	Graded assignment	Optional
Physical Education 3	Tutorials: 30	0	Pass	Obligatory
Sum	420	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Competence Project	Project work: 90	7	Graded assignment	Obligatory
Microprocessor Systems Software Development	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Fundamentals of Electrical Drives	Laboratory classes: 30 Lecture: 30	4	Exam	Obligatory
Mobile Robots	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Obligatory
Supervisory Control and Data Acquisition Systems	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
Elective Courses 7		8	Graded assignment	Obligatory group
The student chooses 2 subjects				
Pneumatic and Hydraulic Automation Equipment	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional
Industrial Measurements with Certificate Up to 1 kV	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional
Electronic Equipment Design	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Automatics Laboratory	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional
Computer Simulation of Control Systems	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional
Decision Making Support and Artificial Intelligence Methods	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional
Network Applications	Laboratory classes: 30 Lecture: 15	4	Graded assignment	Optional
Advanced Industrial Robot Programming	Laboratory classes: 45	4	Graded assignment	Optional
Programming of Computerized Numerical Control Machine Tools	Laboratory classes: 15 Project work: 15 Lecture: 15	4	Graded assignment	Optional
Sum	360	30		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Diploma Seminar	Seminar: 30	3	Graded assignment + exam	Obligatory
Final Project	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Internship	Internship: 0	6	Pass	Obligatory
Elective Courses 8		6	Graded assignment	Obligatory group
The student chooses 3 subjects				
Interfaces in Microprocessor Systems	Laboratory classes: 45	2	Graded assignment	Optional
Automatics of Electrical Drives	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Automation and Measurements in a Power Plant	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Data Protection	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Production Control Methods and Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Application of PLC Controllers in Industrial Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Graphical Programming of Controllers	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Autonomous Robots	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Offline Robots Programming	Laboratory classes: 45	2	Graded assignment	Optional
Medical Robots	Laboratory classes: 15 Project work: 15 Lecture: 15	2	Graded assignment	Optional
Reverse Engineering and 3D Printing	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Optional
Elective Project	Project work: 45	2	Graded assignment	Optional
Sum	165	30		