



Lodz University
of Technology

Study programme

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

Table of contents

Basic information	3
Learning outcomes (in relation to the PQF)	4
Matrix of course modules in relation to learning outcomes and curriculum content	6
ECTS - subjects	16
ECTS indicators	21
Methods of verifying and assessing learning outcomes	22
Professional internships	23
Characteristics of the course	24
Education program	27

Basic information

Name of the field of study:	Mechatronics
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:	2627
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:	105
Professional title awarded to graduates:	inżynier
ISCED code:	0719
Language of study:	polish

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

Discipline	Percentage share
Automation, electronics and electrical engineering	60%
Mechanical engineering	40%

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	1MCH1	Knows and understands advanced topics in mathematics, physics, and computer science, and has detailed knowledge in the fields of electrical engineering, electronics, mechanics, and materials engineering to a degree that allows him to describe and analyze phenomena as well as explain the operating principles of mechatronic components, circuits, and systems.	P6U_W	P6S_WG, P6S_WG_inž
2	1MCH10	Is ready to take responsibility for the tasks carried out, to adhere to professional ethics, and to initiate actions in the interest of the public and the social environment.	P6U_K	P6S_KO, P6S_KR
3	1MCH2	Knows and understands the importance of ethical and professional responsibility in engineering activities in the field of mechatronics, as well as the principles of: creating and developing various forms of entrepreneurship, standardization, occupational health and safety, project management and life cycle analysis.	P6U_W	P6S_WK, P6S_WG_inž, P6S_WK_inž
4	1MCH3	Is familiar with development trends in the field of mechatronics, including issues of innovation, new technologies, and commercialization of results, as well as the principles of intellectual, industrial property, and copyright protection.	P6U_W, P6U_U	P6S_WK, P6S_UW_inž
5	1MCH4	Is able to select and apply IT methods and tools used in engineering practice in the field of mechatronics, with particular emphasis on the design and programming of mechatronic devices and systems, as well as information and communication technologies.	P6U_U	P6S_UW
6	1MCH5	Is able to analyze and evaluate the operation, as well as start up and operate mechatronic devices and systems (mechanical, electrical, and electronic), using advanced techniques and taking into account economic, environmental, and safety limitations, as well as technological and manufacturing capabilities.	P6U_U	P6S_UW, P6S_UW_inž
7	1MCH6	Is able to analyze and interpret data (including measurement data), plan and conduct experiments, perform a critical analysis of results, prepare documentation (including technical documentation), and create a presentation using specialized terminology.	P6U_U	P6S_UK, P6S_UW_inž
8	1MCH7	Is able to plan, organize, and carry out individual work as well as collaborate in a team performing interdisciplinary tasks, and also communicate (including participating in discussions) using specialized terminology, including in a foreign language at the B2 level, in order to present, evaluate, and discuss opinions and positions.	P6U_U	P6S_UK, P6S_UO
9	1MCH8	Is able to continuously deepen and update knowledge in order to define and solve problems in the field of mechatronics, think critically, and act creatively.	P6U_U	P6S_UW, P6S_UU, P6S_UW_inž

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	1MCH9	Is ready for a critical assessment of his own knowledge and skills, for seeking and utilizing available knowledge (including expert opinions), and for taking initiatives and acting in an entrepreneurial manner.	P6U_U, P6U_K	P6S_UK, P6S_KK, P6S_KO

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

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
1	Mathematics I	Basic properties of elementary functions and the application of logical laws and set theory. Matrix calculus, determinants, inverse matrices. Systems of linear equations, complex numbers, differential and integral calculus.	x								x	
2	Physics	Topics of classical and modern physics: energy, work, vibrations, mechanical and electromagnetic waves, and elements of wave optics. Fundamentals of quantum mechanics, atomic structure, and methods of investigating matter.	x						x			
3	Materials Engineering	General characteristics of materials, classification, properties, and applications. Metal alloys, sintered materials, composites, polymers, ceramics. Material structure, crystallization, phase transformations, phase equilibrium systems. Fundamental methods of modifying material properties.	x								x	
4	Engineering Graphics and Technical Documentation	Graphical representation of structures in technical drawings. Dimensioning, description of surface condition, tolerances, standards. Detail and assembly drawings. Creating technical documentation using CAD programs. CAD Electrical systems. Libraries. Creating symbols of elements of electrical documentation. Drawing electrical circuits. Generating material lists. Electrical documentation.			x		x		x			
5	Technical Mechanics I	Basics of statics for planar and spatial systems. Determination of the center of gravity and moments of inertia. Kinematics of a material point and a rigid body. Application of the principles of mechanics to the analysis of motion and equilibrium.	x						x			
6	Entrepreneurship and Innovation	Topics in entrepreneurship, innovation, technology transfer, and commercialization of research results. Basic duties of an entrepreneur, the process of implementing innovations, protection of intellectual property, and financing of business ventures.			x	x					x	
7	Manufacturing Engineering in Electronics	Technology of manufacturing semiconductor structures, including issues of process cleanliness, properties and processing of semiconductor materials, and basic technological processes such as chemical wafer processing, photolithography, and substrate etching.	x						x	x		
8	Strength of Materials	Model of a deformable body. Statically determinate and indeterminate bar structures. Pure and technological shear. Three-dimensional state of strain. Plane bending of beams, frames, and arches. Moments of inertia of plane figures. Deflection line of beams. Torsion of shafts and thin-walled members. Two-dimensional state of stress. Combined loading (strength of materials). Buckling. Stress concentration. Material fatigue.	x						x			
9	Mathematics II	Differential and integral calculus of multivariable and higher-order functions, partial derivatives, extrema, implicit functions, series, and examples of applications.	x								x	
10	English B2 module I	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
11	English B2+ module I	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
12	German B2 module I	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
13	English C1 module I	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
14	Informatics	Construction and operation of computer hardware - computer architecture, communication with external devices. Data processing by the microprocessor, central unit, construction of operational memory. Multitasking and time allocation. Introduction to databases. Creating database objects and performing data operations in a dedicated database environment.	x				x					
15	Electrical Engineering	Basic concepts related to electric current, electrical quantities and their units, as well as elements and sources in electrical circuits. Methods of electrical circuit analysis, including nodal potential methods, superposition, and circuit transformations; issues of energy and power in direct current, energy relationships, and fundamentals of the electromagnetic field, electromagnetic induction, magnetic interactions, as well as classical analysis of linear sinusoidal AC circuits.	x						x		x	
16	Electronics	Basic knowledge of semiconductor physics: the band model, intrinsic and doped semiconductors, current flow through semiconductor structures, principles of operation of diodes, transistors, amplifiers, rectifiers, and voltage regulators—breakdown phenomena, characteristics, and determination of the operating point.	x						x			
17	Information Technology	The course covers the basics of programming in Python and an introduction to creating applications for embedded systems using MicroPython, both in simulation environments and on real devices. An important part of the course is cybersecurity, including threats to modern computer systems, networks, and IoT devices. The course also introduces elements of artificial intelligence, used for learning programming as well as supporting system security and data protection.	x				x					
18	Programming Languages	Procedural and object-oriented programming in mechatronic systems. Data types and their applications, creation of a user interface with typical objects and event handling. Validation of input data, exception handling, and algorithm design.	x				x					
19	Basics of Machine Design	Design and operation of mechanical components, mechanical joints, and machine elements, as well as principles of designing mechanical devices in relation to manufacturing technology and materials science. Basic formulas and relationships necessary for the analysis and verification of machine elements. Typical machine elements and principles of designing mechanical devices in relation to manufacturing technology and materials science. The design workflow from calculations, through 3D models, to detailed (manufacturing) drawings.	x					x				
20	Automation	A review of Laplace operator transfer functions. Open-loop and closed-loop control, signals (errors). Block diagrams of typical control systems and their simplification. Properties and characteristics of basic automation elements. Evaluation of control quality in steady-state and transient conditions, astatic control, aperiodic and oscillatory responses. Backward couplin	x					x	x			

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
21	Modeling and Simulation of Electrical and Electronic Circuits	Familiarization with the SPICE modeling and simulation environment. Analysis of current and voltage waveforms in rectifier circuits. Modeling the operation of a PWM voltage-mode inverter. Transient modeling in RL, RC, and RLC circuits. Modeling passive and active filters. Dual modeling of a DC motor operating in a transient state. Implementation of a design for a given electrical-electronic system and analysis of the obtained results.					x		x			
22	Modelling and Simulation of Mechatronic Systems	Mathematical modeling and numerical simulation of simple mechatronic systems. Use of computational and programming environments to develop and modify simulation software for a mechatronic systems.					x		x			
23	Measurement Systems and Electrical Metrology	Principles of operation of measuring equipment, sensors and signal conditioning circuits, measurement methods, and fundamentals of metrology and measurement uncertainty analysis. Oscilloscopes and multimeters, data transmission (TCP/IP, Ethernet), and control of measurement processes. Design and programming of simple and advanced measurement and control systems in dedicated environments, including LabVIEW.					x		x			
24	Measurement and Control in Mechanics	The use of the graphical programming environment LabVIEW to build diagrams that can be used in measurement and control algorithms in mechanics. The application of components for arrays and graphs, timing, iterative structures with registers, conditional, sequential, approximation of measurement data, reading and writing from files, subroutines, event detection.					x		x			
25	Technical Mechanics II	Kinematics of a point in complex motion. Dynamics of systems of material points. Dynamics of rigid bodies in planar motion. Experimental investigations in the statics and dynamics of mechanical systems.	x						x			
26	English B2 module II	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
27	English B2+ module II	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
28	German B2 module II	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
29	English C1 module II	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
30	Materials Engineering for Electrical Engineering	Issues related to conductive materials and resistive components, electrical insulating materials and capacitors, semiconductor materials and devices, magnetic materials including problems of magnetic data recording and reading, as well as materials with photo- and electro-optical properties.	x							x		
31	Microcontroller Programming	Programming various types of microcontrollers using dedicated programming languages, utilizing hardware libraries that enable the handling of sensors, communication modules, and actuators. Artificial intelligence tools supporting software architecture design, code generation, and documentation.	x				x	x				x
32	Mechatronics with a Competency Project	Design and analysis of mechatronic systems, control systems, sensors, and actuators, as well as fundamentals of programming and embedded systems. Modeling, simulation, and integration of mechanical and electronic components in modern devices. Implementation of a selected mechatronics project by a small group of students, with the possibility of consultations with a project supervisor, supported by active learning methods.	x	x		x	x	x	x	x	x	x

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
33	Electrical Machines and Drives	Principles of operation, structure, mathematical description, and calculation of parameters and characteristics of electrical machines and transformers. Electromechanical energy conversion, electromotive force. Testing and parameterization, operation, and programming of electric drives.	x						x		x	
34	Systems Supporting Design and Visualization	Using a graphical environment to create scenes and animations that support the visualization of the construction and operation of mechatronic objects. Designing a selected device or mechatronic component using dedicated tool platforms.					x				x	
35	CAD 3D	Issues related to the methodology of computer-aided modeling of solid and surface objects, creating and analyzing assemblies of 3D objects and methods of creating technical documentation in the CAD system.					x				x	
36	English B2 module III	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
37	English B2+ module III	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
38	German B2 module III	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
39	English C1 module III	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
40	Mechatronic Components in Household Appliances	Structure and principles of operation of typical household appliances (AGD), their selected subassemblies, actuators, and sensors. Measurement of characteristics of selected household appliance components.						x	x			
41	Flexible Electronics	Overview of applications of flexible electronics—their materials, substrate characteristics, and technologies for manufacturing components and circuits. Concepts of flexible photovoltaics and textronics. Fabrication of a test flexible electronic component, device, and/or circuit.						x	x			
42	Power Semiconductor Devices	Issues of electrical energy conversion and the operation and control of power semiconductor devices, including their parameters, losses, dynamic phenomena, filtering, and overvoltage protection. The subject is complemented by principles of safe operation, cooling, and the use of device models in computer-aided design.						x	x			
43	Sensors in Motor Vehicles	Tasks of various types of sensors used in vehicles. Testing of sensors as well as indicators and meters used in control and measurement equipment.						x	x			
44	Control Systems in Electric Drives	Basic concepts, standards, and actuators of control systems, as well as classification and properties of systems with various types of feedback, including principles of controlling power semiconductor devices in AC and DC circuits.						x	x			
45	Reprogrammable Embedded Systems	Comparison of HDL languages and a detailed discussion of the VHDL language, including concurrent and sequential constructs, finite state machine models, and the design of combinational and sequential circuits.						x	x			

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
46	Measurements and Data Acquisition in Mechatronic System	Measurement of physical quantities and data acquisition in mechatronic systems using analog and digital sensors as well as measurement and control systems. Configuration of measurement chains, signal acquisition, and basic methods of signal processing and analysis in experimental studies of mechatronic systems						x	x			
47	Working Machines	Types of working machines. Construction and operation of transport equipment and their mechanisms. Operational cycles of transport equipment. Workload groups. Safety of working machines. Basic information on industrial transport systems.						x	x			
48	Mobile Robots	Principles of operation and control of mobile robots and applications of autonomous self-propelled systems. Robot programming, trajectory planning methods, and experimental testing with interpretation of mobile robot performance results.						x	x			
49	Machine Tools and Material Removal Processes	Material removal machining methods. Impact of machining processes on the operational properties of products. Construction and technological capabilities of machine tools. Cutting tools and tool systems used in automated production. Monitoring and supervision of machining processes.						x	x			
50	Electromobility	Introduction to electromobility; modeling and simulation of electric drives and vehicles in MATLAB/Simulink; basics of traction batteries and BMS; analysis of driving parameters (range, energy, power).						x	x			
51	Pneumatics and Hydraulics	Properties and preparation methods of pneumatic and hydraulic media as energy carriers in drive systems. Operating principles, construction, and applications of pneumatic and hydraulic actuators and control systems, with particular emphasis on their role in industrial process automation.	x						x			
52	Fundamentals of Biomechatronics	Experimental methods of biomechanics applied in biomechatronics, determining basic parameters of the musculoskeletal-nervous system during various activities, including the assessment of its correct functioning.	x					x		x		
53	Programable Controllers	Practical design, commissioning, and testing of simple control systems. Structure and principles of operation of programmable logic controllers (PLCs), their hardware architecture, and input/output modules. Programming of PLCs in accordance with standards, their diagnostics, and communication in industrial automation systems.					x	x				
54	English B2 module IV	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
55	English B2+ module IV	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
56	German B2 module IV	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
57	English C1 module IV	Selected lexical and grammatical topics at the B2 level based on technical (industry-specific) and business English.								x		
58	Calculation Methods in Mechatronics	Fundamentals of electromagnetic field modeling, Maxwell's equations, and an introduction to the Finite Element Method (FEM) in the analysis of 2D and 3D problems. Calculation of electrical quantities, forces, torques, and parameters of magnetically coupled circuits based on FEM calculations.					x		x		x	

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
59	Digital Signals in Mechanical Engineering	The course covers the analysis and processing of digital signals in mechanical engineering, with particular emphasis on modeling, sampling, quantization, and filtering of signals. Students learn to describe and analyze discrete systems, design measurement setups, and apply numerical methods and computer tools for data acquisition and interpretation.					x		x		x	
60	Diagnostics of Mechatronic Systems	The role of diagnostics in the life cycle of devices and mechanisms of fault formation in electrical and mechanical systems. Methods of acquisition and analysis of diagnostic signals, parameter estimation, diagnostic models, and condition assessment of systems.						x	x			
61	Integrated Micro-Biosystems	Origin and theoretical foundations of integrated micro-biosystems, including physical, physicochemical, and biomedical phenomena used in their operation. Design principles, materials, and manufacturing technologies, as well as application areas such as medical diagnostics, chemical analysis, food and environmental monitoring.						x	x			
62	Electronic Control Systems For Actuators	Fundamentals of electric and electronic actuators and electromechanical and semiconductor switches, with particular emphasis on power electronics and control systems used in mechatronics. Methods of controlling DC, AC, and stepper motors, servomechanisms, control algorithms, and analog and digital implementation using microcontrollers and simulation tools.						x	x			
63	Automotive Electromechanics	Fundamentals of operation of spark-ignition and compression-ignition internal combustion engines, as well as the structure and principles of operation of fuel supply, ignition, starting systems, and vehicle communication buses. Emission reduction systems, safety, comfort, lighting systems, and issues related to hybrid vehicles. Laboratory testing of engine systems, ignition systems, starters, and electrical and photometric parameters of headlights.						x	x			
64	Electronic Components of Drive Systems	Basic power electronic components used in drive systems. Structure of a voltage-source inverter. The role of the braking resistor. Methods of voltage control in inverter systems. Designs of current, angular speed, and position measurement systems.						x	x			
65	SoC Platforms	Issues related to the architecture and principles of operation of System-on-Chip (SoC) systems integrating processors, peripheral systems, and programmable logic in a single integrated circuit. Methods of designing, programming, and commissioning hardware-software applications, and practical applications of SoC platforms in mechatronic and embedded systems.						x	x			
66	Mechatronic Control Systems	Analysis and design of mechatronic control systems using simple dynamic models of continuous-time and discrete-time plants. Basic control structures, controller tuning methods, and assessment of control system quality and stability based on simulation and experimental studies.						x	x			
67	Drive Systems and Control of Working Machines	Types of drive systems in working machine drives: their structure, parameters, and control methods. Relationships in the kinematic and dynamic paths of drives. Methods for selecting and testing drive system components. Dynamics in working machine drives. Drive and machine safety.						x	x			

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
68	Mechatronics in Means of Transport	The structure and characteristics of mechatronic system components used in transportation: sensors and actuators, and the operating principles of selected algorithms. Bench tests of actual mechatronic slip control systems and their design principles.						x	x			
69	Manufacturing Techniques in Mechanical Engineering	Fundamentals of casting processes. Overview and classification of casting technologies and their characteristics. Basics of casting design and preparation of casting documentation. Simulation of casting processes for selected technologies. Fundamentals of plastics processing technology.						x	x			
70	Monitoring and Operation of Electric Vehicles	Vehicle construction and dynamics. Vehicle monitoring systems. Electronic and electromechanical components in vehicles. Internal communication systems (CAN, LIN). Vehicle driving characteristics.						x	x			
71	Robotics	Basic components of a robot and its kinematic chain. Coordinate system transformations, forward and inverse velocity kinematics. The Jacobian and manipulator dynamics, as well as singular configurations. Planning of advanced manipulation tasks using simulation software and programming of industrial robots.	x			x		x				
72	Internship	Introduction to the organization and safe working conditions of work in an enterprise. Acquisition of practical knowledge and application of previously acquired knowledge in an industrial environment.		x					x			x
73	Internet of Things in Household Appliances	The general model of Internet of Things (IoT) infrastructure. Data aggregation and processing systems, sensors, actuators, microcontrollers, single-board computers (SBCs), and wired and wireless communication technologies. Data transmission standards (including 5G, LTE, Wi-Fi, Bluetooth LE, unlicensed bands), low-power IoT systems, communication concepts, and intelligent data processing. Identification issues (RFID, EPC) and data security at the stages of aggregation, transmission, and processing.						x	x			
74	Autonomous Energy Sources	Issues related to the construction and application of autonomous energy sources, such as hydroelectric and wind power plants, fuel cells, heat pumps, and sources utilizing solar energy, piezoelectricity, and temperature differences. Basic operating parameters, practical utilization technologies, and methods for designing autonomous power supply systems.						x	x			
75	Control Systems in Industrial Electronics	Structure and principles of operation of microcontrollers, their architecture, assembly-level programming, and handling of memory, interrupts, peripherals, and communication interfaces. Fundamentals of control systems, measurement, and signal processing, as well as sensors, actuators, and input/output systems used in industrial electronics, including PLCs, industrial computers, programming languages, and industrial data transmission and networking systems.						x	x			
76	Fundamentals of Automotive Mechatronics	Principle of operation of electronic control systems for fuel injection in gasoline and diesel engines, as well as clutch and gearbox control systems. Passive safety systems, gas installations in vehicles and their electronic control systems, as well as vehicle data buses and networks, transmission systems, and diagnostic protocols used in automotive diagnostics.						x	x			

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
77	Power Electronic Converters	Fundamental concepts of power electronics, power semiconductor devices, and types of power electronic converters. Single- and three-phase rectifiers, AC voltage controllers, frequency converters, inverters, converters for DC machine drives, as well as switched-mode power supplies and phenomena occurring in converter systems, such as commutation.						x	x			
78	HDL Languages	Description and design of digital systems using hardware description languages (HDLs) such as VHDL and Verilog. Methods of modeling, simulation, and synthesis of combinational and sequential logic systems, as well as principles of their implementation in programmable structures.						x	x			
79	Analysis and Visualization of Data in Mechatronic	Processing, analysis, and interpretation of experimental data in mechatronic systems. Descriptive statistics and statistical inference. Data processing, chart creation, correlation analysis, and anomaly detection. Use of a dedicated working environment and its libraries.						x	x			
80	Mechanical Vibrations	Free and forced oscillations of linear systems with one and two degrees-of-freedom. Vibration isolators. Vibration of continuous systems.						x	x			
81	Walking Robots	Different gait types of multi-legged walking robots, direct kinematics, inverse kinematics, and workspace of a single robot limb, modeling robot limb motion trajectories using various gait patterns. Selection of actuators in limb joints, using of inverse dynamics to estimate forces acting on robot limbs, support polygon and gait stability investigations by various dynamic metrics. Application of walking robots as mobile Stewart platforms and their control on irregular, unstable, and/or vibrating surfaces.						x	x			
82	Optimization of Manufacturing Systems	The course covers comprehensive topics in manufacturing systems, with particular emphasis on the production technologies for casting and plastic components, their design requirements, and methods for assessing manufacturability. It focuses on optimising manufacturing processes through computer simulations, experimental planning, and improvements in tooling design and production technologies.						x	x			
83	Electric Vehicle Drive Systems	Structure, operation, control and diagnostics of BEV/HEV drives; laboratory measurements on didactic rigs (Nissan Leaf, LEV, motorcycle), regenerative braking, OBDII, battery and BMS.						x	x			
84	Engineering Project	Implementation of a complex problem-oriented project referring to current trends, technologies, and contemporary issues, preferably socially relevant or constituting technological challenges, including elements of project management and life-cycle analysis of mechatronic devices. Work supported by active learning methods. Detailed content depends on the selected and implemented project in the field of mechatronics.		x	x		x	x	x	x		x
85	Intelligent Building Management Systems	Integration of mechatronic resource management systems in intelligent buildings, including energy, water, security, and information systems within a unified BMS. Principles of designing integrated and energy-efficient systems and the role of interdisciplinary coordination.						x			x	

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
86	Vision Systems	Basic theory and thorough practice in the field of broadly understood vision systems, both industrial (used, for e.g., production quality control), as well as laboratory and movie systems. Work in the Motion Capture laboratory, image analysis and processing in MATLAB and Python.						x			x	
87	Switching Devices in Mechatronic	Principles of power supply, control, and protection of mechatronic systems, including overcurrent, overvoltage, and electric shock protection, as well as the role of switching devices. Principles for the selection, testing, and standardization of control equipment, taking into account electromagnetic compatibility and reliability.						x	x			
88	Microautomation	Design and analysis of mechatronic systems operating on discrete values using microcontrollers, logic circuits, and engineering tools such as Matlab, LabView, and Unity. Application of digital automation systems, MEMS devices, PCB boards, and HMI interfaces in engineering practice. Implementation of laboratory experiments in control, visualization, and programming of mechatronic.						x	x			
89	Final Project	Preparation of an engineering thesis: literature review, formulation of work objectives, identification of specific tasks, selection of methods and tools appropriate for solving the problem, conducting experiments, analysis the obtained results. Description of the results. The detailed content depends on the chosen thesis topic.		x	x			x		x	x	x
90	Dynamics of Mechatronic Systems	Fundamentals of electromagnetic field theory. Circuit-field models of electromechanical transducers. Description of physical phenomena using potentials and differential equations. The finite element method (FEM) in one-, two-, and three-dimensional analysis, including material nonlinearities and motion of components, and its application in the design of electrical machines, including motors for electric vehicles.						x	x			
91	High-Temperature Electronics	Operation of electronic devices at elevated temperatures, including temperature ranges of components, environmental constraints, and design solutions resulting from cooling and energy dissipation conditions. Examples of mechatronic solutions and passive and active components, with particular emphasis on silicon carbide (SiC) semiconductors.						x	x			
92	Computer-Aided Design of Electronic Systems	Features and applications of CAD, CAE, CAM, and EDA software packages. Characteristics of a selected EDA environment. Techniques for electronic circuit design.						x	x			
93	Diagnostics of Automotive Mechatronic Systems	Issues related to the reduction of harmful emissions from internal combustion engines, exhaust gas composition and formation, and systems for reducing their harmfulness. Principles of operation of the OBD system, including emission monitors, diagnostic and communication information, interfaces, diagnostic testers, their operating modes, and fault codes used in diagnostics of vehicle mechatronic systems.						x	x			
94	Electromechanical Drive Systems	Selected issues of pulse-width modulation (PWM) and vector control (FOC, DTC). Issues of motor-load interaction, multi-motor systems, and parallel operation of motors.						x	x			
95	Reconfigurable Logic Devices	Principles of operation and architecture of programmable logic devices, in particular FPGAs and CPLDs. Methods of designing, simulating, and implementing digital systems using HDL languages and CAD tools.						x	x			

No.	Course name	Program content	1MCH1	1MCH10	1MCH2	1MCH3	1MCH4	1MCH5	1MCH6	1MCH7	1MCH8	1MCH9
96	Modeling, Identification, and Simulation of Mechatronic Components and Systems	Introduction to mathematical modeling and parameter identification of components and simple mechatronic systems based on experimental data. The use of simple dynamic models and basic estimation methods is presented, including model structure selection, assessment of fit quality, and model validation using measurement data.						x	x			
97	Modelling and Simulation of Hydraulic and Pneumatic Control Systems	The course covers the modeling and simulation of hydraulic and pneumatic control systems using analytical and numerical methods. Students learn the principles of building physical models, performing dynamic analysis, and interpreting the results of computer simulations.						x	x			
98	Automated Drive Systems	Wheel vehicle dynamics, tracked vehicle dynamics, robot actuators, construction of steering mechanisms and drive systems, basics of power supply, spatial orientation, basics of control algorithm. Teamwork on solving a sample problem related to mobile robots.						x	x			
99	Industrial Robots	Analysis of the structure, kinematics, and control of industrial robots and their applications in automated manufacturing systems. Robot programming, selection of drives, sensors, and grippers, and practical use of robots in manipulation and assembly tasks.						x	x			
100	Electronic Control Systems in Vehicles	Safety systems, comfort monitoring, communication, and control in vehicles. Vehicle sensors and information acquisition, also using artificial intelligence tools. Reliability of electronic devices used in vehicles.						x	x			
101	Skill Development Course	Implementation of an individual project under the supervision of an instructor, depending on individual requirements and needs, focused on mechatronic issues.	x						x		x	
102	Diploma Seminar	Public presentation and discussion of mechatronics-related topics and engineering project results; clear problem definition, survey of possible solutions, and effective communication. Retrieval of information from the literature and databases, precise technical language, concise reporting of results, and awareness of further learning needs. Competency exam.					x		x	x		x

ECTS - subjects

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
1	Mathematics I	8				
2	Physics	6				
3	Materials Engineering	4			4	
4	Engineering Graphics and Technical Documentation	3				
5	Technical Mechanics I	4			4	
6	Entrepreneurship and Innovation	5	5			
7	Manufacturing Engineering in Electronics	3			3	
8	Strength of Materials	3			3	
9	Mathematics II	6				
10	English B2 module I	2		2		
11	English B2+ module I	2		2		
12	German B2 module I	2		2		
13	English C1 module I	2		2		
14	Informatics	3				
15	Electrical Engineering	5			5	
16	Electronics	5			5	
17	Information Technology	3				
18	Programming Languages	3				
19	Basics of Machine Design	4				
20	Automation	5			5	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
21	Modeling and Simulation of Electrical and Electronic Circuits	4		4	4	
22	Modelling and Simulation of Mechatronic Systems	4		4	4	
23	Measurement Systems and Electrical Metrology	5		5	5	
24	Measurement and Control in Mechanics	5		5	5	
25	Technical Mechanics II	4			4	
26	English B2 module II	2		2		
27	English B2+ module II	2		2		
28	German B2 module II	2		2		
29	English C1 module II	2		2		
30	Materials Engineering for Electrical Engineering	3			3	
31	Microcontroller Programming	3			3	
32	Mechatronics with a Competency Project	7			7	
33	Electrical Machines and Drives	5			5	
34	Systems Supporting Design and Visualization	4		4	4	
35	CAD 3D	4		4	4	
36	English B2 module III	2		2		
37	English B2+ module III	2		2		
38	German B2 module III	2		2		
39	English C1 module III	2		2		
40	Mechatronic Components in Household Appliances	3			3	
41	Flexible Electronics	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	Power Semiconductor Devices	3			3	
43	Sensors in Motor Vehicles	3			3	
44	Control Systems in Electric Drives	3			3	
45	Reprogrammable Embedded Systems	3			3	
46	Measurements and Data Acquisition in Mechatronic System	3			3	
47	Working Machines	3			3	
48	Mobile Robots	3			3	
49	Machine Tools and Material Removal Processes	3			3	
50	Electromobility	3			3	
51	Pneumatics and Hydraulics	5			5	
52	Fundamentals of Biomechatronics	5			5	5
53	Programable Controllers	4				
54	English B2 module IV	3		3		
55	English B2+ module IV	3		3		
56	German B2 module IV	3		3		
57	English C1 module IV	3		3		
58	Calculation Methods in Mechatronics	4		4	4	
59	Digital Signals in Mechanical Engineering	4		4	4	
60	Diagnostics of Mechatronic Systems	3			3	
61	Integrated Micro-Biosystems	3			3	
62	Electronic Control Systems For Actuators	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	Automotive Electromechanics	3			3	
64	Electronic Components of Drive Systems	3			3	
65	SoC Platforms	3			3	
66	Mechatronic Control Systems	3			3	
67	Drive Systems and Control of Working Machines	3			3	
68	Mechatronics in Means of Transport	3			3	
69	Manufacturing Techniques in Mechanical Engineering	3			3	
70	Monitoring and Operation of Electric Vehicles	3			3	
71	Robotics	4			4	
72	Internship	6				
73	Internet of Things in Household Appliances	3			3	
74	Autonomous Energy Sources	3			3	
75	Control Systems in Industrial Electronics	3			3	
76	Fundamentals of Automotive Mechatronics	3			3	
77	Power Electronic Converters	3			3	
78	HDL Languages	3			3	
79	Analysis and Visualization of Data in Mechatronic	3			3	
80	Mechanical Vibrations	3			3	
81	Walking Robots	3			3	
82	Optimization of Manufacturing Systems	3			3	
83	Electric Vehicle Drive Systems	3			3	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
84	Engineering Project	8				
85	Intelligent Building Management Systems	3		3	3	
86	Vision Systems	3		3	3	
87	Switching Devices in Mechatronic	3		3	3	
88	Microautomation	3		3		
89	Final Project	15			15	
90	Dynamics of Mechatronic Systems	2			2	
91	High-Temperature Electronics	2			2	
92	Computer-Aided Design of Electronic Systems	2			2	
93	Diagnostics of Automotive Mechatronic Systems	2			2	
94	Electromechanical Drive Systems	2			2	
95	Reconfigurable Logic Devices	2			2	
96	Modeling, Identification, and Simulation of Mechatronic Components and Systems	2			2	
97	Modelling and Simulation of Hydraulic and Pneumatic Control Systems	2			2	
98	Automated Drive Systems	2			2	
99	Industrial Robots	2			2	
100	Electronic Control Systems in Vehicles	2			2	
101	Skill Development Course	3		3		
102	Diploma Seminar	3				

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	134.5/210 (64.05%)

Methods of verifying and assessing learning outcomes

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

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

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

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

Professional internships

Duration: 6 weeks

ECTS credits: 6

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

Characteristics of the course

Graduate profile

A graduate of the Mechatronics program (first-cycle studies) is an engineer prepared to work in modern, automated industry. They possess solid knowledge and practical, interdisciplinary skills in electrical engineering, electronics, mechanics, and materials engineering. Unlike programs that focus mainly on automation and robotics systems based on pre-made components, Mechatronics studies teach designing a device as a whole — from its mechanics and choice of materials, through electronics, to the control system — aiming to create coherent, complete products. As a result, the graduate understands not only the principles of individual components, but also the construction and operation of contemporary mechatronic systems, especially those using electric drives, pneumatic and hydraulic systems, and control systems.

During their studies, they acquire the ability to design, analyze, and program mechatronic systems and devices, using specialized IT tools – from programming languages for microcontrollers, through PLC controllers, to engineering software used in industry. They also learn about current development trends, the principles of commercializing research results, and implementing innovative technologies in the field of mechatronics, which increases their attractiveness on the job market.

A Mechatronics student benefits from a very extensive offer of subjects and elective modules, which allows them to flexibly shape their own development path and specialize in chosen areas, in accordance with current technological trends and the needs of innovative industry.

A significant part of the program is implemented in the form of projects, which develops the ability to independently solve engineering problems, work in teams, and communicate technically – skills particularly valued by employers.

Student internships allow direct acquaintance with the industrial environment, integrated mechatronic systems, and the real operating conditions of equipment and installations.

Graduates enter the job market with initial professional experience, ready to take on the role of an engineer in manufacturing and design companies. The acquired competencies prepare graduates for:

- working as a specialist in the design, commissioning, programming, and operation of mechatronic systems, including automation systems as well as machinery and electric drives,
- employment in enterprises of the electromechanical, electronic, automotive, household appliance industries, and in companies integrating automation systems,
- working in research and development (R&D) departments of technology companies, including in the development and testing of new devices and mechatronic systems,
- collaborating on the implementation of innovative technical solutions, including in small and medium-sized enterprises with a technological profile,
- starting your own business in the modern technology sector and continuing education at the second-cycle studies in the field of mechatronics and related areas.

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

The mission and main strategic goals of the University have been defined and precisely specified in Resolution 39/2024 "Development Strategy of Łódź University of Technology for 2025–2030" of the Senate of LUT, adopted on June 26, 2024. The adopted strategy is based on the theme of multi-dimensional COOPERATION with respect for the adopted values, making the University a valued partner for the economy. The individual areas of this strategy can be described as follows:

- impact on the socio-economic environment – emphasizing continuous learning and supporting research for the benefit of the socio-economic environment,
- internationalization – supporting the conduct of research and the publication of its results in international cooperation, as well as developing mobility for staff and students,
- innovation and technology transfer – in collaboration between science and business,
- management and organizational culture – by strengthening cooperation and integration among staff and students,
- science – where the University supports both breakthrough scientific research and researchers, building recognition on the international stage,
- infrastructure – providing modernization and updating of equipment used during research and teaching,
- staff – where the University supports the development of employees through their multifaceted growth,
- talents – striving to attract the best candidates for studies and support their development,
- sustainable development – involving supporting the achievement of goals such as building a zero-emission campus,
- education – that is, building an educational model that prepares graduates for the dynamically changing needs of the socio-

economic environment,

- students – where the University creates conditions that support students in achieving key competencies in line with labor market expectations, also through stimulating and supporting students' scientific activity.

Undergraduate education meets the mission of the University and Faculties, which is confirmed by the following facts:

- defining the program-specific learning outcomes, including those that build knowledge, creativity, and the student's professionalism – here, in addition to knowledge-related outcomes, we indicate such outcomes as: the ability to obtain information from literature, databases, and other sources; the ability to draw conclusions and formulate and justify opinions; skills in individual and teamwork; skills in preparing documentation; skills in preparing and delivering presentations; skills in preparing and conducting experiments; understanding the need for continuous learning; and thinking in an entrepreneurial manner. The practical verification of achieving results occurs through the active participation of Mechatronics students in projects that enhance their competencies, which also include tasks/projects carried out in cooperation with industry. Particularly desirable are competencies in preparing engineering documentation, possessing knowledge of the construction and control of advanced mechatronic systems and devices, as well as knowledge in designing and manufacturing components using microtechnology; skills in preparing computer simulations to analyze and evaluate the operation of electrical, electronic, and mechanical components and systems; gaining knowledge in the field of autonomous internal transport vehicles, as well as becoming familiar with cybersecurity issues. All these elements of knowledge and skills are well aligned with current trends in both scientific research and the needs of the socio-economic environment. Students of the program participate in the work of student teams engaged in the construction of autonomous vehicles as well as a solar vehicle, taking part in various types of competitions and contests, significantly enhancing their skills in the area of solving real engineering problems.
- in the described course of study, we can point to many examples of using both scientific knowledge and modern laboratory facilities to conduct the educational process – e.g., Mechatronics with a competency project, Robotics, Basics of Biomechanics. In addition, the existing infrastructure is used efficiently by introducing innovative teaching methods, including design thinking and case teaching.
- the Mechatronics program is an interdisciplinary field, and its curriculum is closely related to the topics of research conducted in the field of technical sciences and scientific disciplines such as: automation, electronics, electrical engineering, and space technologies; technical computer science; mechanical engineering. The emphasis is placed on preparing graduates to solve engineering problems, working independently or in a group, creativity in action, problem solving according to the latest trends and the needs of specific economic sectors, as well as continuously improving their qualifications. The confirmation of research conducted by the faculty of the program includes, among others, scientific publications carried out also in international cooperation, patents and grants, as well as the improvement of staff qualifications through short- and medium-term trips to foreign scientific and research centers. The knowledge and experience gained in this way are effectively used during the classes conducted, which is confirmed by the good and very good results of periodic surveys of a large part of the staff.
- the courses offered, such as Mechatronics with a competency project, Robotics, Electric Machines and Drives, Programmable Controllers, Mechanics, in a substantive way prepare the student for work in plants and design offices, research and development sections of leading companies in the country, often of the character of international corporations (e.g., ABB Aleksandrów, Besel Brzeg Cantoni Group, Indukta Bielsko-Biała Cantoni Group, Beko, BSH) or research units where research is conducted on solutions of an innovative nature (Promis-Tech, Inovatica AGV, Pro-engineer). The confirmation of the high competencies of Mechatronics students can be found in diploma theses carried out for industry, both large companies and smaller innovative firms (e.g., Rossmann, Inovatica AGV, Pro-engineer). Innovative units in their projects use artificial intelligence in the process of controlling mechatronic systems and devices, including autonomous ones, as well as microtechnologies in the construction of mechatronic components and systems. Ongoing contact with external stakeholders allows for the alignment of the topics of these projects and theses with areas currently important to the socio-economic environment. Graduates of the program are also prepared to start their own business or continue their studies at the third cycle of education.

The prepared concept of education for Mechatronics students is aimed at training personnel for a knowledge-based economy, emphasizing graduates' innovation and creativity, as well as an understanding of the developmental trends occurring in the region's and the country's economy. It also prepares students to enter the field of industrial practice (especially industries involved in the design and production on a milli- and microscale of devices and mechatronic systems), programming devices that control processes and equipment, as well as in the area of technological processes (including those related to the Internet of Things), treated as an expression of innovation and development of this branch of the economy.

Educational objectives and employment and continuing education opportunities

The primary goal of educating graduates of the first-cycle studies in Mechatronics is to acquire solid knowledge in the main field-specific subjects as well as specialized knowledge in the area concerning modern mechatronics (i.e., electronics, electrical engineering, automation, mechanical engineering, technical computer science). Additional objectives include acquiring basic knowledge in the field of work organization, particularly teamwork, knowledge in management, engineering law, protection of intellectual property, innovation monitoring and commercialization of results, economics and occupational safety, as well as the ability to use a foreign language at an intermediate level. The content scope of the specialized subjects was selected in such a way that each graduate would acquire

knowledge and skills that can be directly applied in engineering activities typical of the current labor market, and could take up work in production preparation and supervision positions, as well as in auxiliary positions in research and development units. A student can flexibly shape their educational profile by choosing elective blocks and courses.

Courses such as Mechanics, Strength of Materials, Electrical Engineering, Measurement Systems and Electrical Metrology, Mechatronics with a Competency Project, Basics of Biomechatronics, Electric Machines and Drives, Mechatronic Components in Household Appliances, Dynamics of Mechatronic Systems, Programmable Controllers, Microautomation, prepare a future engineer in a substantive way, who can find work in household appliance industry plants located in the Łódź region, for example, BSH Home Appliances Ltd., at electromechanical industry plants such as EMIT Żychlin Cantoni Group, Besel Brzeg Cantoni Group, Indukta Bielsko-Biała Cantoni Group, Celma Cieszyń Cantoni Group. Another group of subjects related to automotive electromechanics prepares the student to work in plants producing for the automotive industry. In addition, the graduate is prepared to work in industries manufacturing mechatronic systems – electromechanical, aviation, machine tool, as well as other facilities operating and servicing mechatronic systems and the machines and devices in which they are used. Graduates of first-cycle studies (Level 6) may apply for admission to second-cycle studies (Level 7). A graduate can continue studying at Level 7 in the same field, choose to deepen their knowledge in related fields using advanced tools and knowledge in mechatronics, electronics, technical computer science, mechanical engineering, and automation.

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

The curriculum of the first-cycle Mechatronics program originates from the combination of Mechatronics study programs that have been implemented for many years at the Faculty of Mechanical Engineering and the Faculty of Electrical Engineering, Electronics, Computer Science, and Automation. We note that for many years the study program has been consulted with the socio-economic environment, starting with the development of a joint program for both faculties, and it is continuously updated. The currently proposed curriculum contains a great deal of content and subjects that have already been consulted, originating from the previous program. The necessary modernization of the program, updating of subject content, and adaptation to current needs and requirements were, during the preparation of the new program, consulted again with the socio-economic environment, especially regarding the content of new subjects that appeared in the course grid. We can point out here some examples of the effects of these consultations conducted with companies interested in cooperating with graduates of the Mechatronics program: EMIT S.A., Cantoni Group, Kellanova, the company PPHU Colorex, Damel S.A., SIEMENS.

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

In accordance with the recruitment resolution for the 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: 45	8	Exam	Obligatory
Physics	Laboratory classes: 30 Lecture: 30	6	Graded assignment	Obligatory
Materials Engineering	Laboratory classes: 45 Lecture: 15	4	Graded assignment	Obligatory
Engineering Graphics and Technical Documentation	Project work: 45	3	Graded assignment	Obligatory
Technical Mechanics I	Tutorials: 30 Lecture: 15	4	Exam	Obligatory
Entrepreneurship and Innovation	Laboratory classes: 30 Lecture: 45	5	Graded assignment	Obligatory
Sum	420	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Manufacturing Engineering in Electronics	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
Strength of Materials	Tutorials: 30 Lecture: 15	3	Graded assignment	Obligatory
Mathematics II	Tutorials: 55 Lecture: 35	6	Exam	Obligatory
Foreign Language Module 1		2	Graded assignment	Obligatory group

Course	Number of hours	ECTS points	Form of verification	Obligatory
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
Informatics	Laboratory classes: 30 Lecture: 10	3	Exam	Obligatory
Electrical Engineering	Tutorials: 30 Laboratory classes: 15 Lecture: 30	5	Graded assignment	Obligatory
Electronics	Laboratory classes: 45 Lecture: 15	5	Exam	Obligatory
Information Technology	Laboratory classes: 30 E-learning: 15	3	Graded assignment	Obligatory
Physical Education 1	Tutorials: 30	0	Pass	Obligatory
Sum	445	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Programming Languages	Laboratory classes: 15 Lecture: 10	3	Graded assignment	Obligatory
Basics of Machine Design	Laboratory classes: 15 Project work: 30 Lecture: 15	4	Graded assignment	Obligatory
Automation	Tutorials: 30 Laboratory classes: 30 Lecture: 30	5	Exam	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Elective Courses 1		4	Graded assignment	Obligatory group
The student chooses 1 subject				
Modeling and Simulation of Electrical and Electronic Circuits	Laboratory classes: 15 Project work: 30	4	Graded assignment	Optional
Modelling and Simulation of Mechatronic Systems	Laboratory classes: 15 Project work: 30	4	Graded assignment	Optional
Elective Courses 2		5	Graded assignment	Obligatory group
The student chooses 1 subject				
Measurement Systems and Electrical Metrology	Laboratory classes: 45 Lecture: 30	5	Graded assignment	Optional
Measurement and Control in Mechanics	Laboratory classes: 45 Lecture: 30	5	Graded assignment	Optional
Technical Mechanics II	Tutorials: 30 Laboratory classes: 15 Lecture: 15	4	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
Materials Engineering for Electrical Engineering	Laboratory classes: 30	3	Graded assignment	Obligatory
Physical Education 2	Tutorials: 30	0	Pass	Obligatory
Sum	445	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Microcontroller Programming	Project work: 30	3	Graded assignment	Obligatory
Mechatronics with a Competency Project	Laboratory classes: 60 Project work: 30 Lecture: 30	7	Exam	Obligatory
Electrical Machines and Drives	Laboratory classes: 30 Lecture: 30	5	Exam	Obligatory
Elective Courses 3		4	Graded assignment	Obligatory group
The student chooses 1 subject				
Systems Supporting Design and Visualization	Laboratory classes: 45	4	Graded assignment	Optional
CAD 3D	Laboratory classes: 45	4	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
Elective Course 1		9	Graded assignment	Obligatory group
Student wybiera przedmioty z trzech bloków				
Block 1.1 Mechatronic Systems in Household Appliances		3	Graded assignment	Optional
Mechatronic Components in Household Appliances	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.2 Flexible Mechatronic Systems		3	Graded assignment	Optional
Flexible Electronics	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku

Course	Number of hours	ECTS points	Form of verification	Obligatory
Block 1.3 Electronic Systems in Mechatronics		3	Graded assignment	Optional
Power Semiconductor Devices	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.4 Vehicle Mechatronics		3	Graded assignment	Optional
Sensors in Motor Vehicles	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.5 Mechatronic Drive Systems		3	Graded assignment	Optional
Control Systems in Electric Drives	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.6 Electronic Microsystems		3	Graded assignment	Optional
Reprogrammable Embedded Systems	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.7 Cyber-physical Mechatronic Systems: Measurements, Control, and Simulations		3	Graded assignment	Optional
Measurements and Data Acquisition in Mechatronic System	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.8 Mechatronics in Working Machines		3	Graded assignment	Optional
Working Machines	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.9 Vehicles and Mobile Robots		3	Graded assignment	Optional
Mobile Robots	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.10 Production Systems and Techniques		3	Graded assignment	Optional
Machine Tools and Material Removal Processes	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 1.11 E-Mobility		3	Graded assignment	Optional
Electromobility	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Sum	375	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Pneumatics and Hydraulics	Laboratory classes: 20 Project work: 10 Lecture: 15	5	Graded assignment	Obligatory
Fundamentals of Biomechanics	Laboratory classes: 10 Project work: 10 Lecture: 10	5	Graded assignment	Obligatory
Programable Controllers	Laboratory classes: 30	4	Graded assignment	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 4		4	Graded assignment	Obligatory group
The student chooses 1 subject				
Calculation Methods in Mechatronics	Project work: 30 Lecture: 15	4	Graded assignment	Optional
Digital Signals in Mechanical Engineering	Project work: 30 Lecture: 15	4	Graded assignment	Optional
Elective Block 2		9	Graded assignment	Obligatory group
Student wybiera przedmioty z trzech bloków				
Block 2.1 Mechatronic Systems in Household Appliances		3	Graded assignment	Optional
Diagnostics of Mechatronic Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.2 Flexible Mechatronic Systems		3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Integrated Micro-Biosystems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.3 Electronic Systems in Mechatronics		3	Graded assignment	Optional
Electronic Control Systems For Actuators	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.4 Vehicle Mechatronics		3	Graded assignment	Optional
Automotive Electromechanics	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.5 Mechatronic Drive Systems		3	Graded assignment	Optional
Electronic Components of Drive Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.6 Electronic Microsystems		3	Graded assignment	Optional
SoC Platforms	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.7 Cyber-physical Mechatronic Systems: Measurements, Control, and Simulations		3	Graded assignment	Optional
Mechatronic Control Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.8 Mechatronics in Working Machines		3	Graded assignment	Optional
Drive Systems and Control of Working Machines	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.9 Vehicles and Mobile Robots		3	Graded assignment	Optional
Mechatronics in Means of Transport	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.10 Production Systems and Techniques		3	Graded assignment	Optional
Manufacturing Techniques in Mechanical Engineering	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Block 2.11 E-Mobility		3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Monitoring and Operation of Electric Vehicles	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Physical Education 3	Tutorials: 0	0	Pass	Obligatory
Sum	315	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Robotics	Laboratory classes: 30 Lecture: 30	4	Exam	Obligatory
Internship	Tutorials: 0	6	Pass	Obligatory
Elective Block 3		9	Graded assignment	Obligatory group
Student wybiera przedmioty z trzech bloków				
Block 3.1 Mechatronic Systems in Household Appliances		3	Graded assignment	Optional
Internet of Things in Household Appliances	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.2 Flexible Mechatronic Systems		3	Graded assignment	Optional
Autonomous Energy Sources	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.3 Electronic Systems in Mechatronics		3	Graded assignment	Optional
Control Systems in Industrial Electronics	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.4 Vehicle Mechatronics		3	Graded assignment	Optional
Fundamentals of Automotive Mechatronics	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.5 Mechatronic Drive Systems		3	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Power Electronic Converters	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.6 Electronic Microsystems		3	Graded assignment	Optional
HDL Languages	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.7 Cyber-physical Mechatronic Systems: Measurements, Control, and Simulations		3	Graded assignment	Optional
Analysis and Visualization of Data in Mechatronic	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.8 Mechatronics in Working Machines		3	Graded assignment	Optional
Mechanical Vibrations	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.9 Vehicles and Mobile Robots		3	Graded assignment	Optional
Walking Robots	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.10 Production Systems and Techniques		3	Graded assignment	Optional
Optimization of Manufacturing Systems	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Block 3.11 E-Mobility		3	Graded assignment	Optional
Electric Vehicle Drive Systems	Laboratory classes: 30 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
Engineering Project	Project work: 60	8	Graded assignment	Obligatory
Elective Course 5		3	Graded assignment	Obligatory group
The student chooses 1 subject				
Intelligent Building Management Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Vision Systems	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Sum	345	30		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Elective Courses 6		3	Graded assignment	Obligatory group
The student chooses 1 subject				
Switching Devices in Mechatronic	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Microautomation	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Optional
Final Project	Diploma Thesis: 0	15	Pass	Obligatory
Elective Block 4		6	Graded assignment	Obligatory group
Student wybiera przedmioty z trzech bloków				
Block 4.1 Mechatronic Systems in Household Appliances		2	Graded assignment	Optional
Dynamics of Mechatronic Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.2 Flexible Mechatronic Systems		2	Graded assignment	Optional
High-Temperature Electronics	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.3 Electronic Systems in Mechatronics		2	Graded assignment	Optional
Computer-Aided Design of Electronic Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.4 Vehicle Mechatronics		2	Graded assignment	Optional
Diagnostics of Automotive Mechatronic Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.5 Mechatronic Drive Systems		2	Graded assignment	Optional
Electromechanical Drive Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.6 Electronic Microsystems		2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Reconfigurable Logic Devices	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.7 Cyber-physical Mechatronic Systems: Measurements, Control, and Simulations		2	Graded assignment	Optional
Modeling, Identification, and Simulation of Mechatronic Components and Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.8 Mechatronics in Working Machines		2	Graded assignment	Optional
Modelling and Simulation of Hydraulic and Pneumatic Control Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.9 Vehicles and Mobile Robots		2	Graded assignment	Optional
Automated Drive Systems	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.10 Production Systems and Techniques		2	Graded assignment	Optional
Industrial Robots	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Block 4.11 E-Mobility		2	Graded assignment	Optional
Electronic Control Systems in Vehicles	Laboratory classes: 30 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Skill Development Course	Project work: 30	3	Graded assignment	Obligatory subjects to choose from
Diploma Seminar	Seminar: 30	3	Graded assignment + exam	Obligatory
Sum	240	30		