Lodz University of Technology

Study programme

Faculty:	Faculty of Chemistry
Major:	Computer Science in Environmental Protection
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:	Computer Science in Environmental Protection
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:	2725
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:	0712
Language of study:	polish

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

Discipline	Percentage share
Chemical science	56%
Technical computing and telecommunications	35%
Automation, electronics and electrical engineering	9%

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	**1IWS1**	Knows and understands complex issues in mathematics, physics, electrical engineering, biology and chemistry at an advanced level, necessary for understanding and describing physical phenomena and processes occurring in the environment.	P6U_W	P6S_WG
2	**1IWS2**	Knows and understands complex issues in the fields of computer science, telecommunications, electronics, and electrical engineering at an advanced level, necessary for the analysis and design of complex teleinformatics, electrical, and electronic systems.	P6U_W	P6S_WG
3	**1IWS3**	Selects the appropriate chemical terminology and nomenclature necessary to describe the structure, basic properties, and reactivity of elements and chemical compounds.	P6U_W	P6S_WG
4	**1IWS4**	Recalls the principles of safe waste management, waste sorting and disposal, as well as the rational use of natural and man-made resources, and issues related to the life cycle analysis of devices, systems, and technical objects, as well as information technologies.	P6U_W	P6S_WG
5	**1IWS5**	Konows issues necessary for understanding the social, economic, legal, and other non-technical conditions of engineering activity, as well as the principles of creating and developing various forms of entrepreneurship, including individual entrepreneurship.	P6U_W	P6S_WK
6	**1IWS6**	Is able to develop and conduct appropriate experiments using properly selected research methods, as well as analyze and interpret data along with assessing the reliability of the results, recognize systemic and non-technical aspects of undertaken actions, present and evaluate different opinions and positions, and discuss them.	P6U_U	P6S_UW, P6S_UO
7	**1IWS7**	Is able to independently and in a team formulate and solve complex engineering problems related to the construction, operation, and design of measurement and analytical apparatus and information data processing systems, identify sources of errors in planned and conducted experiments, and effectively prevent them by applying health and safety principles.	P6U_U	P6S_UW, P6S_UO
8	**1IWS8**	Is able to use the knowledge he/she possesses from various areas to design, build, and operate telecommunication, electrical, or electronic systems.	P6U_U	P6S_UW

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
9	**1IWS9**	Can obtain information from literature, databases, and other appropriately selected sources, including in a foreign language; has language skills in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages; including in the field of environmental protection and computer science, independently plans and carries out their own lifelong learning, takes part in the debate.	P6U_U	P6S_UW, P6S_UK, P6S_UO, P6S_UU
10	**1IWS10**	Is ready to work individually and in a team, utilizing acquired knowledge while adhering to legal and ethical principles; he presents the results of his work, conducts self-assessment and peer assessment, as well as assesses risks and the consequences of the activities performed.	P6U_K	P6S_KK, P6S_KO, P6S_KR

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

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
1	Environmental Chemistry	Chemical terminology and nomenclature, essential for determining the structure, basic properties, and reactivity of chemical elements and compounds. Designing and conducting appropriate experiments using appropriate research methods. Analyzing and interpreting data, including assessing the reliability of results. Presenting, evaluating, and discussing diverse opinions and positions.	x		x			x				
2	Introduction to Statistical Analysis of Environmental Data	Learning to independently and in a team develop and conduct experiments using appropriate research methods, as well as to analyze and interpret data and assess the reliability of test results.	x					x				
3	Fundamentals of Electrical Engineering	Introductory concepts: signal, voltage, current, electrical quantity symbols, units, and typical values. Elements of electrical circuits and their connections. Ohm's and Kirhoff's laws. Energy sources. Information on nonlinear elements and methods for analyzing nonlinear systems. Resonance in electrical circuits. Transients.		x				x				
4	Information Technologies I	Working with Microsoft Office 365. Microsoft Outlook group collaboration tools. How a modern computer works. Task processing environments. Basics of using the Windows operating system. Local and access networks. Internet services: HTTP and DNS.		x						x		
5	Introduction to Engineering Drawing	Principles of projection in technical drawing using 2D drawing software, including European and American orthographic projections. Dimensioning simple elements. Principles of creating simple cross-sections. Creating simple two-dimensional objects and machine parts. Designing a simple object composed of solid elements connected by rigid relationships.							x			
6	Mathematics I	Number sequences, their properties, and limits. Differential calculus of functions of one variable. Limits of functions. The derivative and its geometric and physical interpretation. Integral calculus of functions of one variable.	x					x				
7	The Art of Studying	Changing from a school learning style to an academic one – acquiring knowledge independently and using modern methods. Developing skills: self-presentation, public speaking, discussion, teamwork, preparing reports. Research methodology, time management, coping with stress, overcoming the 'blank page'.					x					x
8	The Basics of Environmental Ethic	Religions, philosophies, science, technical progress versus the environment. Main trends in ecophilosophy. Characteristics of factors that threaten natural environment. Sustainable development - definition, history and basic concepts. International Conventions and Declarations on the Protection of Biodiversity. Ecological policy and strategy for the eco-development of Poland.					x					x
9	Chemical Analysis of the Environmen	Classification of methods used in chemical analysis. Parameters characterizing analytical methods. Types of errors in quantitative analysis. Collection and preparation of samples for analysis. Basic methods of quantitative and instrumental analysis.	x		x			x				

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
10	Ecology and the Legal Basis of Environmental Protection	Legal regulations regarding environmental protection in Poland. Protection of environmental resources. Counteracting environmental pollution. Preventing events that could cause serious accidents. Economic and legal measures to protect the environment. The scope and basic concepts of ecology. The structure and functioning of ecosystems.					x				x	x
11	Geographic Information System	Fundamentals of cartography. Databases and data structure. Geometric and thematic stratification of objects, principles of mapping object structures. Integration of space and information. Numerical models of terrain. Space representation as a vector model. Raster models. Examples of GIS models.						x			x	
12	Information Technologies II	Introduction to algorithms. Basic program components and simple data types. Compound data types. Boolean operations, conditionals, and loops. Writing your own functions. Compound data types.		x						x		
13	Environmental Physics	Kinematics and dynamics of a material point. Work, power, and energy. Laws of conservation of energy. Dynamics of rotational and translational motion of a rigid body. Oscillatory motion. Mechanical oscillator. Law of universal gravitation. Electrostatic field.	x					x	x			
14	Mathematics II	Differential calculus of functions of several variables. Integral calculus of functions of two variables. Ordinary differential equations. Linear differential equations of second order. Numerical and functional series.	x					x				
15	English B2 module I	Part I of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
16	English B2+ module I	Part I of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
17	English C1 module I	Part I of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
18	German B2 module I	Part I of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
19	Hydrology and Water Management	Water occurrence and cycle. Earth's water balance. Origin, typology, and environmental conditions of water resources. River systems. Methods of conducting hydrometric measurements. Quantitative assessment of water resources. Wetlands. Seas and oceans. Physical, chemical, and biological indicators of water quality.	x			x		x				
20	Digital Environmental Monitoring	Environmental monitoring: purpose, tasks, legal regulations, structure, and organization of environmental monitoring in Poland. Environmental monitoring systems: monitoring of air, surface water, groundwater, soil, and land surface. IT systems for collecting, processing, and sharing monitoring results. Environmental databases. Sources of information on nature conservation. Geological and soil science databases. Hydrological and hydrogeological databases.	x					x	x			

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
21	Electronic Measuring Systems	Principles of construction and operation of basic components and their application in measuring electrical and non-electrical quantities. Analog and digital signals and their processing, A/D and D/A converters, analog and digital multimeters and oscilloscopes. Measurement methods, classification criteria, characteristics, and examples of measurement equipment selection.		x				x		x		
22	Microprocessor and Embedded Systems	The structure of modern microprocessors and their operating mechanisms. The role of internal registers, input/output registers, stack memory, interrupt systems, and direct memory access. Types of memory. Data types and structures. The microcontroller as a universal microprocessor system. Selected microcontroller peripherals.		x						x		
23	Object Oriented Programming	Object-oriented programming concepts: constraints of procedural programming, the object concept, object-oriented program structure. Basic concepts of object-oriented programming (Python): classes and objects/instances, methods and attributes/fields, encapsulation, polymorphism, inheritance, and application examples.		x				x				
24	Environmental Microbiology	The occurrence and importance of microorganisms in nature and the human economy. Classification of microorganisms, systematic review of microorganisms. Morphological and physiological characteristics of microorganisms: viruses, bacteria, cyanobacteria, fungi, algae. Microflora of natural environments.	x					x				
25	Standardization and Digital Laboratory and Industrial Information Systems	The objectives, principles, and benefits of standardization. Levels of standardization. Certification testing; declaration of conformity; CE marking. The role of metrological traceability in quality assurance and quality control systems. Systems responsible for collecting, processing, and analyzing data in chemical laboratories and industrial plants. The importance of information management software (LIMS) during the implementation and operation of a quality management system.	x				x		x			
26	English B2 module II	Part II of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
27	English B2+ module II	Part II of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
28	English C1 module II	Part II of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
29	German B2 module II	Part II of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
30	Geology, Soil Science and Waste Management	The origin and structure of the Earth. Geological time. Characterization and identification of minerals and rocks. Soil-forming processes. Chemical composition and properties of soils. Responsibilities of waste management entities. Sources and types of raw materials, by-products, secondary raw materials; end-of-waste status. Characterization, segregation, reuse, and storage of waste. Waste disposal methods.	x			x	x	x				

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
31	Digital Meteorology	Physical characteristics of the atmosphere, its chemical composition, and origin. Atmospheric thermodynamics. The role of water in shaping atmospheric processes. Heat and water circulation in the atmosphere. Pressure gradient, Coriolis, friction, and centripetal forces. Types of climates on Earth. Evolution of Earth's climate.					x	x				
32	Polymers in Environmental Protection	Methods of obtaining and using polymers. Types of polymers. (Bio)degradation, aging, and environmental degradability. Disposal and recycling of used polymer materials.	x			x		x				
33	Installations and Environmental Protection Equipment	Selected devices for reducing pollutant content in exhaust gases (settling chambers, cyclones, multicyclones, bag filters and electrostatic precipitators, absorbers and adsorbers). Wastewater treatment devices.			x				x			
34	Wireless Systems and the Impact of Electromagnetic Waves on the Environment	Categories and properties of radio communication systems. Network architectures. Electromagnetic spectrum management and frequency bands used in radio communication systems. Basic properties of electromagnetic fields and waves. Interaction of electromagnetic waves with dielectrics and conductors.		x			x		x	x		
35	Databases	Databases as network services – servers and clients, database management systems, connection ports, and access data. Databases as models of the real world – relational and object-relational models, tables, views, indexes, sequences, keys, triggers and their interdependencies, integrity constraints. Data types, methods for storing large text documents and multimedia data.		x						x		
36	English B2 module III	Part III of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
37	English B2+ module III	Part III of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
38	English C1 module III	Part III of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
39	German B2 module III	Part III of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
40	History and Development of Technical Civilization	Impact of alchemy and chemistry on civilization, periodization of chemical history, rise of chemical industry, atom and element concepts, phlogiston theory, law of mass conservation. Chemistry as an exact science – works of Dalton, Avogadro, Berzelius, Mendeleev’s periodic law. Development of organic chemistry, stereochemistry, coordination chemistry, electrochemistry, thermochemistry, solution chemistry, and industrial synthesis. Nuclear chemistry, evolution of environmental protection concepts, influence of world wars on chemistry and ecology, post-WWII environmental changes.					x					x

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
41	Contemporary Technical Engineering	Industrial revolutions from the age of steam to the age of the disappearing human-machine barrier. Industry 4.0 and 5.0. Intelligent computing. Cyber-physical systems. Quantum computers. Big data. 5G and 6G cellular networks. The 2030 Agenda for Sustainable Development. Renewable energy sources and nuclear power. Smart cities. Circular bioeconomy. Cybersecurity. Innovative medical technologies. Diseases of civilization.					x					x
42	Wastewater and Water Treatment Technologies	Basic water treatment processes: coagulation and precipitation, filtration, iron removal, and manganese removal. Physical and chemical methods of water disinfection. Advanced oxidation methods in water treatment technology.	x			x		x				
43	Basis of Life Cycle Analysis	Introduction to Life Cycle Assessment (LCA), discussing basic assumptions consistent with the principle of sustainable development in ecological, economic, and social aspects (Life Cycle Sustainability Analysis (LCSA), Life Cycle Management (LCM), Life Cycle Thinking (LCT), Life Cycle Costs (LCC), Social Life Cycle Analysis (S-LCA), etc.). ISO 14040 and 14044 standards. Assessment of risks and environmental impacts of products throughout their life cycle.				x	x	x				
44	Modeling of Environmental Processes and Threats	Modeling the dispersion of pollutants in the atmosphere: Basic meteorology, the atmospheric diffusion equation, atmospheric diffusion coefficients, pollutant uptake from the emitter, model simplifications, and compliance requirements for emissions with applicable regulations. Modeling noise propagation in the environment. Performing mathematical modeling of real-world environmental cases using sample programs.	x			x		x	x			
45	Radiological Hazards and Its Neutralization	Radioactivity, decay law, radiation properties and applications. Radiological protection. Legal guidelines for activities involving radiation. Environmental radiation monitoring. Radiation incident situations, procedure schedule, obligations and responsibilities. Prevention of radiation incidents.			x	x		x	x			
46	Artificial Intelligence	Classes of problems and areas of interest in Artificial Intelligence. Artificial Neural Networks –types, applications, and basic learning methods (supervised and unsupervised); Optimization methods – the classical approach using techniques based on differential calculus. The Genetic Algorithm as a non-classical method for finding desired solutions. Fundamentals of expert systems, fuzzy logic, artificial neural networks, and genetic algorithms.		x				x				
47	Designing Websites	Concepts and technologies related to website design, Basics of HTML5 and CSS3, Content Management Systems (CMS): Joomla!, WordPress, Drupal, Templates, themes and plugins in websites - applications and selection criteria, Transferring CMS websites between media and servers, WordPress Multisite - configuration of installation files, Creating website backups, Principles of website positioning in search engines.		x					x	x		
48	English B2 module IV	Part IV of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
49	English B2+ module IV	Part IV of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
50	English C1 module IV	Part IV of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
51	German B2 module IV	Part IV of the business language course with elements of industry-specific language; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
52	Environmental Technologies I	General definitions and classification of adsorption systems. Physical and chemical adsorption. Introduction to catalysis. Catalysis in industry. The essence of catalytic processes. Methods for managing polymer waste. Causes of the accumulation and methods for preventing the generation and storage of polymer waste in the human environment. Integrated quality, occupational health and safety, and environmental policy. Risk in legal regulations and safety standards. Risk management: risk analysis, assessment, and control. Overview of hazard factors.	x					x	x	x		
53	EEIA Technologies in Environmental Protection I	Renewable energy sources: types, origin, characteristics, availability, conversion methods, technical parameters, converter design, economics, and operating conditions. DC supply systems, linear and operational amplifiers, feedback, generators, pulse-shaping circuits, power amplifiers, active filters, A/D and D/A converters.		x				x	x	x		
54	Security of Information Systems	IT system security principles. Network attacks. Network protection. Cryptography and public key infrastructure. Server and host security. Security monitoring. Post-compromise data analysis. Incident management.		x					x			
55	Environmental Impact Assessment and Preparation of Environmental Investments	Polish and international EIA regulations, Natura 2000 areas, impact forecasts and reports, methodology of studies. Influence of procedures on economic and political decisions, transboundary process, required investment documents. Spatial planning rules, funding and grant settlement, public procurement, documents for starting works, commissioning and operating permits.	x				x				x	
56	Summative Module	Assessment of learning outcomes through completion of a group project task. Identification of competency gaps and assignment to a remedial project. Knowledge and skills enhancement to achieve all program learning outcomes.	x	x					x	x	x	
57	Digital Ecotoxicology	Classification of poisons, causes of intoxication, toxicity factors and mechanisms. Mutagenesis, carcinogenesis, teratogenesis. Fate of pollutants in ecosystems, anthropogenic sources, toxicokinetics, toxicodynamics, transport, bioaccumulation, biomarkers, toxicity tests, biodegradation. Impact on populations, resistance, in silico ecotoxicology, modeling tools.	x		x			x				
58	Fundamentals of Toxicology	Introduction of basic concepts related to toxicology. Selected aspects of the history of forensic toxicology. Factors determining toxicity The influence of toxic compounds on the human body. Mechanisms of action of poisons in the human body (absorption, transport, metabolism, distribution, accumulation and excretion). Selected classes of toxic compounds (eg drugs, drugs, organic solvents, heavy metals, pesticides, food additives, etc.). Characteristics and specificity of occupational poisoning - legal aspects.	x		x			x				
59	Environmental Management System	The concept and evolution of the term of quality in economic and social history. Development of quality management systems and creation of industry management systems. Discussion of the objectives and assumptions of environmental management systems and standards - EMAS and ISO 14001. Requirements of the environmental management system ISO 14001. Basics of environmental planning: assessment of environmental impacts and aspects and setting environmental objectives of the organization. Principles of conducting an audit of the environmental management system.					x	x				

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
60	Quality Management in Information Technology	Software quality, Software quality management, ISO quality models. Basic information. Introduction to software quality. The importance of software quality. The definition of quality. System requirements and quality attributes. Quality tree. Basic definitions: functionality, efficiency, credibility, satisfaction, flexibility. Attributes and metrics. McCall's quality model. Product quality factors. Factors and metrics. McCall's definitions of quality metrics. Quality in the software development process.					x	x				
61	English Environmental Terminology	Students will get aquainetd with the basic vocabulary used in scientific literature. The basics allowing to translate texts from English into Polish in the field of environmental chemistry and related sciences will be provided. Students will learn the nomenclature concerning the inorganic and organic compounds, will get acquainted with the nomenclature concerning basic chemical reactions and processes and with the basic chemical terminology related to environmental protection processes.									x	
62	English Technical and IT Terminology	Classes in vocabulary, reading comprehension, and discussions in various technical fields related to the field of study: e.g. electronics, IT, medicine, materials engineering. Nomenclature of numbers and units. The most common mistakes. The structure of scientific publications and reports. Scientific presentations.									x	
63	Environmental Technologies II	Identification of environmental hazards: air pollution, ozone depletion, greenhouse effect, sulfur oxide emissions (acid rain), soil degradation, water pollution, deforestation, climate change. Environmental protection analysis in accordance with the principles of sustainable development. Understanding the principles of green chemistry and technology.	x					x	x	x		
64	EEIA Technologies in Environmental Protection II	Processing of visual and thermal images: types, resolution, filtering, segmentation, morphology, 3D reconstruction, classification, cameras and environmental applications. Mobile technologies and IoT: wireless networks, roaming, security, protocols.		x				x	x	x		
65	Internship	Familiarization with company structure, safety regulations, and management systems. Understanding environmental conditions, technological processes, automation, and work organization. Gaining knowledge of lab work, technologists' duties, problem-solving, and building professional contacts.					x		x			x
66	Interdisciplinary Project	Building teams that group students with a diverse range of interests in order to ensure varied substantive contributions to the projects being developed.	x	x					x	x	x	
67	Engineering Diploma Thesis	Thesis structure: introduction, aim and scope, theoretical section, research part, conclusions, bibliography. Nature of the thesis – experimental or computational, carried out according to program requirements. Presentation and interpretation of results in relation to defined objectives.	x	x					x		x	
68	Engineering Laboratory	Students work individually in laboratories of their supervisors. The aim of the course is to plan and carry out experiments in the frame of engineering project.						x	x	x	x	

No.	Course name	Program content	1IWS1	1IWS2	1IWS3	1IWS4	1IWS5	1IWS6	1IWS7	1IWS8	1IWS9	1IWS10
69	Labour Law	History and characteristics of labor law, sources of law, definition and features of employment contract, employment relationship, termination. Rights and duties of employees and employers, working time, leave, remuneration, dispute resolution, health and safety. Non-standard employment forms, comparison with civil contracts, self-employment. Parental rights, collective labor law, social insurance. Protection of intellectual property.					x				x	x
70	Law for Engineer	The Polish system of law. Source of law. Introduction to jurisprudence. Introduction to law civil. Introduction to administrative law and administrative proceeding. Elements of labour law, health and safety. The basis of economic and trade law. Introduction to tax law. Introduction to European law. Protection of intellectual property.					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	Environmental Chemistry	8			8	
2	Introduction to Statistical Analysis of Environmental Data	2			2	
3	Fundamentals of Electrical Engineering	4				
4	Information Technologies I	3			3	
5	Introduction to Engineering Drawing	3				
6	Mathematics I	8				
7	The Art of Studying	2	2	2		
8	The Basics of Environmental Ethic	2	2	2		
9	Chemical Analysis of the Environmen	7				
10	Ecology and the Legal Basis of Environmental Protection	4			4	
11	Geographic Information System	3			3	
12	Information Technologies II	3			3	
13	Environmental Physics	4				
14	Mathematics II	7				
15	English B2 module I	2		2		
16	English B2+ module I	2		2		
17	English C1 module I	2		2		
18	German B2 module I	2		2		
19	Hydrology and Water Management	3			3	
20	Digital Environmental Monitoring	4			4	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
21	Electronic Measuring Systems	6				
22	Microprocessor and Embedded Systems	6				
23	Object Oriented Programming	4			4	
24	Environmental Microbiology	2				
25	Standardization and Digital Laboratory and Industrial Information Systems	3				
26	English B2 module II	2		2		
27	English B2+ module II	2		2		
28	English C1 module II	2		2		
29	German B2 module II	2		2		
30	Geology, Soil Science and Waste Management	6			6	
31	Digital Meteorology	2				
32	Polymers in Environmental Protection	2				
33	Installations and Environmental Protection Equipment	2			2	
34	Wireless Systems and the Impact of Electromagnetic Waves on the Environment	9			9	
35	Databases	5			5	
36	English B2 module III	2		2		
37	English B2+ module III	2		2		
38	English C1 module III	2		2		
39	German B2 module III	2		2		
40	History and Development of Technical Civilization	2	2	2		
41	Contemporary Technical Engineering	2	2	2		

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
42	Wastewater and Water Treatment Technologies	3			3	
43	Basis of Life Cycle Analysis	2			2	
44	Modeling of Environmental Processes and Threats	3			3	
45	Radiological Hazards and Its Neutralization	3				
46	Artificial Intelligence	4			4	
47	Designing Websites	3			3	
48	English B2 module IV	3		3		
49	English B2+ module IV	3		3		
50	English C1 module IV	3		3		
51	German B2 module IV	3		3		
52	Environmental Technologies I	9		9	9	
53	EEIA Technologies in Environmental Protection I	9		9	9	
54	Security of Information Systems	5				
55	Environmental Impact Assessment and Preparation of Environmental Investments	4			4	
56	Summative Module	8		8	8	
57	Digital Ecotoxicology	2		2		
58	Fundamentals of Toxicology	2		2		
59	Environmental Management System	2		2	2	
60	Quality Management in Information Technology	2		2	2	
61	English Environmental Terminology	2		2	2	2
62	English Technical and IT Terminology	2		2	2	2

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
63	Environmental Technologies II	7		7	7	
64	EEIA Technologies in Environmental Protection II	7		7	7	
65	Internship	6				
66	Interdisciplinary Project	2		2		
67	Engineering Diploma Thesis	15		15	15	
68	Engineering Laboratory	4			4	
69	Labour Law	3	3	3		
70	Law for Engineer	3	3	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)	63/210 (30%)
The total number of ECTS credits to be earned by a student through courses in the fields of humanities or social sciences	7
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	122/210 (58.1%)

Methods of verifying and assessing learning outcomes

Verifying the achieved learning outcomes requires the use of diverse forms of student assessment, appropriate to the categories of knowledge, skills, and social competences to which they relate. The selection of appropriate tools also depends on the specific nature of the subject and the format of instruction and is described in each individual course card. Achievement of the required learning outcomes is assessed through:

1. written assignments (exams, tests, reports, essays, projects, posters, thesis, etc.);
2. oral presentations (oral knowledge tests, public speaking, e.g., presentations, etc.);
3. practical and/or project tasks (team and individual);
4. observation and assessment of student activity during classes;
5. student self-assessment and peer assessment (especially in the case of team projects);
6. competency examination and diploma examination.

Assessment may be formative (partial, repeated throughout the course) and/or summative (final grade). The final assessment result is given on the currently applicable grading scale. During the first class, the course director or instructor is obligated to discuss the course syllabus and to formulate and document the assessment methods and conditions for conducting assessments of learning outcomes.

Professional internships

Internship duration: 6 weeks, ECTS credits: 6.

Internship in a technical position (or an organizational position requiring at least the same technical competencies) related to the application of information technology/telecommunications/electronics/electrical engineering/automation in environmental protection.

Completion of the internship is based on timesheets and a final report.

Characteristics of the course

Graduate profile

Graduates of the “Computer Science in Environmental Protection” program are prepared to undertake professional work requiring engineering competencies in environmental protection processes and technologies, electrical, electronic, and ICT systems, including databases and basic programming. Graduates have the ability to use the specialized language of environmental law, utilize digital repositories of environmental information, and independently solve complex problems related to waste management, environmental documentation, and administrative permits necessary for enterprise operations. They are also prepared to plan and implement ICT systems related to environmental protection and other needs of businesses and public administration bodies. Graduates are specialists in computer science and practical environmental protection at the enterprise and public administration levels.

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

Environmental protection, according to the Constitution of the Republic of Poland, is the responsibility of both public authorities and citizens. Therefore, it is essential to educate professionals in this field. Lodz University of Technology is one of the universities that has been offering environmental protection studies for many years.
The "IT in Environmental Protection" program is a unique educational offer that combines IT competences with broadly understood environmental protection issues.

With reference to the "Development Strategy of Lodz University of Technology for 2025–2030" (Resolution No. 39/2024 of the Senate of Lodz University of Technology of 26 June 2024 on the adoption of the Strategy of Lodz University of Technology for 2025–2030; https://p.lodz.pl/uczelnia/strategia-uczelni), the study program implemented in the IWOŚ field of study is closely related to, among others, the following objectives:
Developing a model for educating students and doctoral students, preparing graduates for the dynamically changing needs of the socio-economic environment.

Lodz University of Technology, as a research university, conducts groundbreaking scientific research and supports the development of its scientists and their international recognition.

The course content offered within the IWOŚ program is closely aligned with current trends in scientific research conducted by research and teaching staff from the Faculty of Chemistry of Lodz University of Technology and the Faculty of Environmental and Environmental Management of Lodz University of Technology. The program covers topics in information technology, statistical analysis of environmental data, environmental chemistry, environmental law, digital environmental monitoring, waste management, modeling of environmental processes and threats, and the preparation and implementation of environmental investments. This ensures that the curriculum not only reflects the latest scientific trends and achievements but also enables students to develop the competencies necessary to conduct research and implement innovative solutions in modern environmental protection.

Collaboration with the socio-economic environment also includes the participation of company representatives in curriculum consultations, the organization of joint research projects and educational initiatives, as well as supporting the development of competencies of students and university staff through participation in training courses, workshops, and study visits to partner companies. The IWOŚ program, due to its interdisciplinary nature, required collaboration from TUL academics representing various institutes and other organizational units from the TUL. The program offers a cross-section of subjects related to broadly defined environmental protection, chemistry, information systems, their security, and elements of law.

Educational objectives and employment and continuing education opportunities

The aim of the education is for students to acquire general and engineering competencies required by PQF level 6 in selected disciplines: "Chemistry," "Technical Information Technology and Telecommunications," and "Automation, Electronics, and Electrical Engineering," with particular emphasis on environmental protection, with a scope adequate to the current and anticipated future needs of the labor market, economy, and society.

In addition, students will be prepared to undertake professional work requiring engineering and technical competencies in environmental protection processes and technologies, electrical, electronic, and ICT systems, including databases and basic programming. They will be able to speak the specialized language of environmental law, utilize digital repositories of environmental information, and independently solve basic problems related to waste management, environmental documentation, and administrative permits necessary for enterprise operations. They will be prepared to plan and implement ICT systems related to environmental

protection and other needs of enterprises and public administration bodies. Graduates will be specialists in computer science and practical environmental protection at the enterprise and public administration levels.

Graduates will be prepared to undertake second-cycle studies in fields related to environmental protection or computer science.

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

The following socio-economic entities participated in the consultations conducted in 2020: Atlas sp. z o.o., the Łęczyca District Office, and Flexi Power Group sp. z o.o., sp. k.

In 2025, the following additional entities expressed their positive opinions:

- GIS Support sp. z o.o., which stated: „We particularly commend the discussion of issues related to Geographic Information Systems (GIS). This is a set of modern knowledge, tools, and technologies that are essential in contemporary environmental protection and other sectors of the economy.”
- McART sp. z o.o. particularly highly rated the educational content related to IT system security.
- According to the Business Council at the Faculty of Chemistry of the Lodz University of Technology, „the proposed curriculum well reflects contemporary needs resulting from the crucial and ever-increasing importance of digitization in all areas of life, including business. Computer Science in Environmental Protection' as a field of study combines IT competencies with environmental protection issues.”

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

In accordance with the recruitment resolution.

The unit organizing education

Faculty of Chemistry

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Environmental Chemistry	Tutorials: 30 Laboratory classes: 60 Lecture: 45	8	Exam	Obligatory
Introduction to Statistical Analysis of Environmental Data	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory
Fundamentals of Electrical Engineering	Tutorials: 15 Laboratory classes: 15 Lecture: 30	4	Graded assignment	Obligatory
Information Technologies I	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Introduction to Engineering Drawing	Laboratory classes: 45	3	Graded assignment	Obligatory
Mathematics I	Tutorials: 45 Lecture: 45	8	Exam	Obligatory
Elective Courses 1		2	Graded assignment	Obligatory group
The student chooses one module from the group.				
The Art of Studying	Seminar: 15	2	Graded assignment	Optional
The Basics of Environmental Ethic	Seminar: 15	2	Graded assignment	Optional
Sum	**420**	**30**		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Chemical Analysis of the Environmen	Laboratory classes: 75 Lecture: 15	7	Exam	Obligatory
Ecology and the Legal Basis of Environmental Protection	Project work: 15 Lecture: 45	4	Graded assignment	Obligatory
Geographic Information System	Laboratory classes: 45	3	Graded assignment	Obligatory
Information Technologies II	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Environmental Physics	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Mathematics II	Tutorials: 45 Lecture: 45	7	Exam	Obligatory
Foreign Language Module 1		2	Graded assignment	Obligatory group
The student chooses one module from the group.				
English B2 module I	Tutorials: 30	2	Graded assignment	Optional
English B2+ module I	Tutorials: 30	2	Graded assignment	Optional
English C1 module I	Tutorials: 30	2	Graded assignment	Optional
German B2 module I	Tutorials: 30	2	Graded assignment	Optional
Physical Education 1	Tutorials: 30	0	Pass	Obligatory
Sum	**450**	**30**		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Hydrology and Water Management	Laboratory classes: 15 Lecture: 15	3	Exam	Obligatory
Digital Environmental Monitoring	Laboratory classes: 40 Lecture: 15	4	Graded assignment	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Electronic Measuring Systems	Laboratory classes: 45 Lecture: 30	6	Graded assignment	Obligatory
Microprocessor and Embedded Systems	Project work: 45 Lecture: 30	6	Exam	Obligatory
Object Oriented Programming	Laboratory classes: 45 Lecture: 15	4	Graded assignment	Obligatory
Environmental Microbiology	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory
Standardization and Digital Laboratory and Industrial Information Systems	Laboratory classes: 30 Project work: 30	3	Graded assignment	Obligatory
Foreign Language Module 2		2	Graded assignment	Obligatory group
The student chooses one module from the group.				
English B2 module II	Tutorials: 30	2	Graded assignment	Optional
English B2+ module II	Tutorials: 30	2	Graded assignment	Optional
English C1 module II	Tutorials: 30	2	Graded assignment	Optional
German B2 module II	Tutorials: 30	2	Graded assignment	Optional
Physical Education 2	Tutorials: 30	0	Pass	Obligatory
Sum	**445**	**30**		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Geology, Soil Science and Waste Management	Laboratory classes: 30 Project work: 15 Lecture: 30	6	Exam	Obligatory
Digital Meteorology	Project work: 15 Lecture: 15	2	Graded assignment	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Polymers in Environmental Protection	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory
Installations and Environmental Protection Equipment	Project work: 15 Lecture: 15	2	Graded assignment	Obligatory
Wireless Systems and the Impact of Electromagnetic Waves on the Environment	Laboratory classes: 75 Project work: 15 Lecture: 45	9	Graded assignment	Obligatory
Databases	Project work: 30 Lecture: 30	5	Graded assignment	Obligatory
Foreign Language Module 3		2	Graded assignment	Obligatory group
The student chooses one module from the group.				
English B2 module III	Tutorials: 30	2	Graded assignment	Optional
English B2+ module III	Tutorials: 30	2	Graded assignment	Optional
English C1 module III	Tutorials: 30	2	Graded assignment	Optional
German B2 module III	Tutorials: 30	2	Graded assignment	Optional
Physical Education 3	Tutorials: 30	0	Pass	Obligatory
Elective Courses 2		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
History and Development of Technical Civilization	Seminar: 15	2	Graded assignment	Optional
Contemporary Technical Engineering	Seminar: 15	2	Graded assignment	Optional
Sum	**435**	**30**		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Wastewater and Water Treatment Technologies	Laboratory classes: 30 Lecture: 15	3	Exam	Obligatory
Basis of Life Cycle Analysis	Project work: 15 Lecture: 15	2	Graded assignment	Obligatory
Modeling of Environmental Processes and Threats	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Radiological Hazards and Its Neutralization	Project work: 30 Lecture: 15	3	Graded assignment	Obligatory
Artificial Intelligence	Laboratory classes: 45 Lecture: 15	4	Exam	Obligatory
Designing Websites	Project work: 30 Lecture: 15	3	Graded assignment	Obligatory
Foreign Language Module 4		3	Exam	Obligatory group
The student chooses one module from the group.				
English B2 module IV	Tutorials: 30	3	Exam	Optional
English B2+ module IV	Tutorials: 30	3	Exam	Optional
English C1 module IV	Tutorials: 30	3	Exam	Optional
German B2 module IV	Tutorials: 30	3	Exam	Optional
Elective Courses 3		9	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Environmental Technologies I	Laboratory classes: 30 Project work: 15 Lecture: 75	9	Graded assignment	Optional
EEIA Technologies in Environmental Protection I	Laboratory classes: 30 Project work: 45 Lecture: 45	9	Graded assignment	Optional
Sum	**420**	**30**		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Security of Information Systems	Laboratory classes: 30 Project work: 30 Lecture: 15	5	Exam	Obligatory
Environmental Impact Assessment and Preparation of Environmental Investments	Project work: 15 Lecture: 45	4	Exam	Obligatory
Summative Module	Project work: 90	8	Graded assignment	Obligatory subjects to choose from
Elective Courses 4		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Digital Ecotoxicology	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Fundamentals of Toxicology	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Optional
Elective Course 5		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Environmental Management System	Project work: 15 Lecture: 15	2	Graded assignment	Optional
Quality Management in Information Technology	Project work: 15 Lecture: 15	2	Graded assignment	Optional
Elective Courses 6		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
English Environmental Terminology	Tutorials: 30	2	Graded assignment	Optional
English Technical and IT Terminology	Tutorials: 30	2	Graded assignment	Optional
Elective Courses 7		7	Graded assignment	Obligatory group
The student chooses 1 course from the group.				

Course	Number of hours	ECTS points	Form of verification	Obligatory
Environmental Technologies II	Seminar: 30 Project work: 15 Lecture: 45	7	Graded assignment	Optional
EEIA Technologies in Environmental Protection II	Laboratory classes: 45 Lecture: 45	7	Graded assignment	Optional
Sum	**405**	**30**		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Internship	Internship: 0	6	Pass	Obligatory
Interdisciplinary Project	Project work: 30	2	Graded assignment	Obligatory subjects to choose from
Engineering Diploma Thesis	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Engineering Laboratory	Seminar: 15 Project work: 65	4	Graded assignment + exam	Obligatory
Elective Courses 8		3	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Labour Law	Project work: 15 Lecture: 30	3	Graded assignment	Optional
Law for Engineer	Project work: 15 Lecture: 30	3	Graded assignment	Optional
Sum	**155**	**30**		