



Lodz University
of Technology

Study programme

Faculty:	Faculty of Chemistry
Major:	Analytical Chemistry
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:	Analytical Chemistry
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:	2695
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:	108
Professional title awarded to graduates:	inżynier
ISCED code:	0531
Language of study:	polish

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

Discipline	Percentage share
Chemical science	100%

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	1ACH1	Has advanced knowledge and understanding of mathematics, physics, electrical engineering and chemistry, enabling the understanding of physical phenomena and chemical processes, including those occurring in nature.	P6U_W	P6S_WG
2	1ACH2	Has advanced knowledge and understanding of chemical analytics, explains concepts related to metrology, measurement data quality management, selection and validation of analytical methods, analysis and interpretation of measurement data.	P6U_W	P6S_WG
3	1ACH3	Knows and understands issues related to the life cycle analysis of devices, systems and technical objects, as well as information technologies supporting analytical processes.	P6U_W	P6S_WK
4	1ACH4	Knows and understands the issues necessary to understand the social, economic, legal and other non-technical conditions of engineering activities, as well as the principles of creating and developing various forms of entrepreneurship, including individual entrepreneurship.	P6U_W	P6S_WK
5	1ACH5	Is able to independently and collaboratively design and conduct experiments and calculations appropriate for the given problem using properly selected methods and techniques, analyzes the results in the context of systemic aspects, and presents various opinions and positions while participating in a debate.	P6U_U	P6S_UW, P6S_UK, P6S_UO
6	1ACH6	Is able to validate an analytical method, properly select and calculate validation parameters, and prepare complete documentation in accordance with quality requirements.	P6U_U	P6S_UW
7	1ACH7	Is able to apply the principles of green chemistry in practice; takes into account aspects related to the disposal of chemical reagents; applies occupational health and safety principles and uses personal protective equipment appropriately.	P6U_U	P6S_UW
8	1ACH8	Uses computer tools to process, visualize, and evaluate chemical data.	P6U_U	P6S_UW
9	1ACH9	Able to communicate verbally and in writing also in a foreign language in accordance with the requirements specified for the B2 level of the Common European Framework of Reference for Languages, able to acquire and integrate information from scientific literature, databases, and other appropriately selected sources, including in a foreign language, in order to solve complex engineering problems and formulate conclusions, plans and carries out lifelong learning.	P6U_U	P6S_UK, P6S_UU

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	1ACH10	Is ready to consciously assume the role of an analytical chemist, undertake critical analysis of information, formulate his/her own position, including in relation to expert opinions; think and act in an entrepreneurial, ethical and responsible manner, initiate and implement activities for the development of the social and economic environment.	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	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
1	General and Inorganic Chemistry I	Fundamental concepts, laws, and models describing the structure of matter, the atom, and nuclear phenomena. Structure and properties of chemical compounds, types of bonds, the periodic table of elements, and equilibria in solutions. Reaction mechanisms, stoichiometric calculations, and the application of physicochemical processes in material design.	x				x					
2	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					
3	Information Technology and Artificial Intelligence	Operation of Microsoft Office 365, collaborative tools, and fundamentals of Windows 10/11 operating system management. Principles of computer operation, task processing environments, local and access networks, the Internet, network services, and e-services in administration and economy. Data security, privacy protection, online threats and defense methods, basics of artificial intelligence, and the use of software for chemical formula creation and advanced data analysis.			x					x		
4	Techniques and Methods of Work in the Laboratory	Laboratory safety rules, operation of basic equipment, and techniques for solution preparation and analysis. Assembly of apparatus for unit processes in organic chemistry, including distillation, crystallization, extraction, and other laboratory operations. Sampling, preparation, and processing of solid, liquid, and gaseous samples, analyte enrichment methods, derivatization, and accreditation requirements.		x					x			
5	The Art of Studying	Structure and organization of higher education, history and organization of Lodz University of Technology and the Faculty of Chemistry. Study regulations, types of classes, specifics of chemistry studies, individual study paths, and international mobility. Interdisciplinary doctoral school, specialization, diploma thesis, and internships. Effective methods of mental work, self-presentation, self-education, and personal development.				x					x	
6	Machine Science and Engineering Graphics	Fundamentals of machine design. Principles of preparing and interpreting technical drawings. Orthogonal and axonometric projections, creating cross-sections, and dimensioning.	x							x		
7	Computer-Aided Engineering Design - CAM-CAD	Theory of technical drawing, use of computer programs supporting design, CAD software.	x							x		
8	Environmental Ethics	Fundamentals of ecology as a science, its history, principles, research methodology, and links to evolution, adaptations, and speciation processes. Population and ecosystem ecology: structure, functions, dynamics, biogeochemical cycles, and major world biomes. Applied ecology, environmental threats, ecophilosophy, international conventions, sustainable development, and nature protection strategies in Poland and the EU (Natura 2000).				x						x

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
9	Art and Chemistry	Artworks and characteristics of pigments, tempera, varnishes, and natural paints used historically and today. Concept of conservation, chemical agents applied in painting, sculpture, and architecture, with examples of their use. Modern methods for authenticity testing of artworks, dating techniques, and their possibilities and limitations.				x						x
10	General and Inorganic Chemistry II	Classification and nomenclature of inorganic compounds, their structure, properties, preparation methods, and oxidation-reduction reactions. Properties and applications of main group elements and transition metals, allotropes, industrial processes, and materials used in various industries. Ionic equilibrium, pH calculations, redox reactions and equation balancing, and stoichiometric calculations for mixtures and excess reagents.	x				x					
11	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					
12	Physics and Technical Chemistry	Fundamentals of mechanics: SI unit system, dimensional analysis, kinematics and dynamics of a material point, rotational and oscillatory motion. Conservation of energy, work and power, gravitational, electrostatic and magnetic fields, electromagnetic induction, and LC circuits. Elastic and electromagnetic waves, phenomena of interference, diffraction, polarization, and basics of geometrical optics and optical instruments.	x				x			x		
13	Introduction to Data Analysis	Types of measurement errors, methods of error reduction, and basics of calculations with approximate numbers and error propagation. Statistical data analysis methods: probability distributions, parameter estimation, confidence intervals, linear and nonlinear regression, and hypothesis testing. Advanced data analysis techniques, including variance analysis, data smoothing, and practical data processing using spreadsheets and specialized software.					x			x		
14	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	
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 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	
17	German B2 module I	Part I of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	
18	Green Chemistry	The concept of sustainable development and the principles of green chemistry and green engineering, including Anastas and Winterton guidelines. Green analytical chemistry, catalysis as its cornerstone, and life cycle assessment of products in the context of environmental protection. Analysis of green chemistry applications in laboratories and industry, impact on climate change, and presentations and discussions within projects and seminars.							x			x

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
19	Industrial Property	Patent protection, trademarks, and industrial designs, procedures for acquiring exclusive rights and principles of their enforcement, practical applications of safeguarding technical solutions in economic activities.				x						
20	Intellectual Property Protection	Protection of scientific, artistic and digital creations, copyright regulations and fair use principles, methods of recognizing infringements and effective management of intellectual properties rights in institutions and organizations.				x						
21	Organic Chemistry	Electronic structure of atoms, hybridization, types of chemical bonds, and formalism for describing chemical structures and reactions. Properties, nomenclature, isomerism, and stereochemistry of organic compounds: alkanes, alkenes, alkynes, aromatics, alcohols, ethers, aldehydes, ketones, carboxylic acids and derivatives, amines. Reaction mechanisms (SN1, SN2, E1, E2, electrophilic and nucleophilic substitutions), synthesis planning, and criteria for selecting optimal methods.	x				x					
22	Analytical Chemistry	Fundamentals of analytical chemistry: role, parameters characterizing methods, analytical errors, and statistical interpretation of results. Analytical techniques: acid-base titration, redox reactions, complexometry, and precipitation reactions with mechanisms and influencing factors. Criteria for method selection, scientific information sources, application of complex compounds in chemical analysis, and citation principles.	x	x			x					
23	Physical Chemistry I	Fundamentals of thermodynamics: concept of a system, state parameters, equation of state, and thermodynamic functions with their dependencies. Application of the first and second laws of thermodynamics in chemistry for energy calculations, process characterization, and chemical and phase equilibria. Solution properties, principles of distillation, colligative quantities, and thermodynamic equilibrium constants in gaseous and liquid systems.	x				x			x		
24	Electrical Engineering with Elements of Electronics	Basic electrical quantities, properties of components in DC and AC circuits, and methods of circuit analysis. Principles of measuring voltage, current, and resistance, three-phase circuits, and operation of selected electrotechnical and electronic devices. Covering circuit assembly and measurements, as well as handling electrotechnical and electronic equipment.	x				x			x		
25	Analytical Calculations	Calculation of concentrations and analytical computations based on chemical reaction equations. Calculations in classical analytical methods such as titrimetric and gravimetric analysis, and in selected instrumental techniques. Interpretation and computation of standardized determinations in chemical analysis.					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	

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
28	English C1 module II	Part II of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	
29	German B2 module II	Second part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of soft skills oriented around the future working environment of the university graduate.									x	
30	Physical Chemistry II	Chemical and ionic equilibria in solutions, concepts of pH and pK, electrolyte conductivity, and applications of electrochemical measurements. Electrochemical cells, potentials, Nernst equation, potentiometry, chemical reaction kinetics, temperature effects, and homogeneous catalysis. Transport and interfacial phenomena: diffusion, Fick's laws, adsorption, adsorption isotherms, and heterogeneous catalysis.	x				x			x		
31	Polymers and Composites	Structure, properties, and classification of polymers and polymerization mechanisms: radical, ionic, coordination, and step-growth. Analysis of physical structure, molecular weight, morphology, and properties of industrial polymers and polymer composites with various fillers. Methods for testing mechanical, thermal, electrical, and optical properties of polymers, preparation of composite materials, and design of materials with targeted property profiles.	x				x					
32	Basics of Biochemistry	Fundamentals of biochemistry: cell structure, small and macromolecules, and their biological significance. Structure and functions of nucleic acids, DNA replication, genetic information flow, and roles of proteins, enzymes, and antibodies. Metabolic pathways and energy-producing processes (glycolysis, Krebs cycle, oxidative phosphorylation) and techniques for analyzing DNA, amino acids, and sugars.	x				x					
33	Basics and Validation of Analytical Procedures	Measurement procedures, calibration and verification of instruments, reference materials, measurement traceability, and estimation of measurement uncertainty. Validation of analytical methods, quality control in laboratory testing, correlation between physicochemical properties and analytical procedures, and preparation of validation documentation. Principles of Good Laboratory Practice (GLP), legal regulations, quality assurance systems, compliance inspections, and development of SOPs and corrective actions.		x				x				
34	Forensic Chemistry	Fundamentals of forensic chemistry: terminology, history, types of forensic traces, and procedures for their collection and preservation. Chemical and physical methods for trace analysis, application of instrumental techniques (LA-ICP-MS, SEM-EDS, ToF-SIMS), and examination of drugs, hair, and fingerprints. Preparation of expert opinions and presentations on the use of analytical techniques for evidence analysis and document authenticity verification.	x			x						x
35	Chemometrics	Fundamentals of chemometrics: concepts of mathematical statistics, multivariate probability distributions, correlation, and covariance. Data analysis methods: statistical tests, nonlinear regression, goodness-of-fit assessment, and multivariate data analysis (PCA, clustering, classification). Practical application of chemometric methods using spreadsheets and specialized data analysis software.								x		
36	Electronic Sources of Chemical Information	Introduction to scientific journal platforms (ACS, Wiley, RCS, Elsevier) and databases such as Reaxys, SciFinder, Scopus, Web of Science, Knovel, and JCS. Practical use of databases for scientific information retrieval and literature compilation. Creating a personal database and preparing reference bibliographies using EndNote Web.								x		

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
37	English B2 module III	Part III of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	
38	English B2+ module III	Part III of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	
39	English C1 module III	Part III of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	
40	German B2 module III	Third part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of soft skills oriented around the future working environment of the university graduate.									x	
41	Selected Methods of Instrumental Analysis	Fundamentals of instrumental methods in chemical analysis: classification, calibration, atomic and molecular spectroscopy, UV-VIS-IR spectrophotometry, ICP-AES, and optical and electrochemical techniques. Principles and applications of X-ray methods, mass spectrometry (MS, MS/MS), ionization techniques, analyzers, spectrum interpretation, and analysis of biomolecules and isotopes. Practical determination of elements and compounds using spectroscopic, electrochemical, chromatographic, and thermogravimetric methods in environmental, biological, and industrial samples.		x			x					
42	Trace Analysis and Methods Used in Trace Analysis	Trace and surface analysis methods: ICP-OES, AAS, ICP-MS, LA-ICP-MS, ToF-SIMS, and SEM-EDS, including sample preparation techniques. Modern concepts in trace analysis and designing measurement strategies for biomarkers using advanced analytical methods. Microwave digestion of biological samples, determination of macro- and microelements, and surface analysis of biomarkers using spectrometric and microscopic techniques.		x			x					
43	Spectroscopy	Fundamentals of molecular spectroscopy: UV-VIS, vibrational spectroscopy (IR, Raman), Raman imaging, and chemometric methods in spectral analysis. Nuclear Magnetic Resonance (NMR): spectrometer design, registration methodology, interpretation of 1D and 2D spectra, chemical shifts, coupling constants, and relaxation processes. Characteristics of emission and fluorescence, fluorescence imaging techniques, quenching of excited states, and applications of spectroscopy in qualitative and quantitative analysis.		x			x			x		
44	Separation Methods and "omics" Techniques	Modern analytical strategies in bio-chemical sciences, systemomics and omics techniques (genomics, proteomics, metabolomics, lipidomics) using separation and spectrometric methods. Fundamentals of gas and liquid chromatography: separation principles, instrumentation, detectors, quantitative analysis methods, and coupled techniques (GC-MS, LC-MS, LC-NMR). Sample preparation and application of separation methods for complex matrices, chromatogram interpretation, and industrial and research laboratory applications.		x			x	x				
45	English B2 module IV	Part IV of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
46	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	
47	English C1 module IV	Part IV of the business language course with elements of industry-specific language; developing all language skills; developing and improving soft skills oriented around the graduate's future work environment.									x	
48	German B2 module IV	Fourth part of a business language course with elements of industry-specific terminology; development of all language skills; development and improvement of soft skills oriented around the future working environment of the university graduate.									x	
49	Computational and Simulation Techniques in Chemistry	Concept of computer experiments, creation of real-system models, and engineering calculations and simulations. Fundamentals of molecular modeling: molecular mechanics, force fields, molecular dynamics, and methods for incorporating environmental effects. Structural and energetic analysis of chemical systems, data formats in computational packages, and basics of molecular dynamics simulations.								x		
50	Chemical Sensors and Biosensors	History and classification of chemical sensors and their analytical and operational parameters. Types of sensors: electrochemical, optical, mass, thermal, biosensors, and systems such as artificial nose, tongue, and Lab-on-a-Chip. Design and characterization of catalytic, resistive, potentiometric sensors and piperazine derivatives for hydrogen detection.	x							x		
51	Analytics and Environmental Monitoring	Environmental monitoring: objectives, tasks, legal regulations, systems for monitoring air, water, soil, waste, and integration with European and global networks. Measurement techniques, data processing systems, bioindication and biomonitoring of environmental pollutants, and radiation monitoring. Assessment of environmental quality, pollution analysis, gamma radiation dose measurements, and determination of radionuclide concentrations in the atmosphere.		x			x					
52	Industrial Analysis and Quality Management Systems	Objectives of industrial analysis, methods of quality and process control, standardization and organization of industrial laboratory work. Sampling, storage and preparation of samples, and general analyses in industries such as fuels, lubricants, metal alloys and ore concentrates. Determination of components in cements, fuels, fertilizers and pharmaceuticals using gravimetric, distillation, spectrophotometric and flame photometric methods. Development of quality concepts, quality management systems and quality tools, including TQM. ISO 9001, ISO 14001 and ISO 17025 standards and requirements for quality, environmental management and laboratory competence. Implementation and certification of management systems and benefits for the organization.		x	x		x					
53	Summative Module	The capstone module assesses students' achievement of the learning outcomes specified for the entire Chemical Analysis program. Project-based tasks enable the verification of knowledge, skills, and social competencies, as well as the identification of gaps in student preparation.										

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
54	Electrochemical Analytical Methods	Introduction to electrochemistry, classification of electroanalytical methods, and structure and characteristics of the electrical double layer. Electrode processes, types of electrodes, and measurement techniques: chronopotentiometry, chronoamperometry, voltammetry, impedance spectroscopy, and stripping analysis. Investigation of metal corrosion, determination of electroactive surface area, electrode reaction kinetics, and dissociation parameters using electrochemical methods.		x			x					
55	Analytics of Energy Resources and Biosubstrates	Characteristics of lignocellulosic biomass, methods of its hydrolysis (thermal, acid, enzymatic), and analysis of hydrolysate composition. Production of platform and energy-relevant compounds from biomass, use of hydrolysates as fermentation media, and biological processes for lactic acid, biogas, and hydrogen generation. Manufacturing of biodegradable polymers, biorefinery concepts, and analysis of catalyst effects, impurities, and biomass type on process efficiency at laboratory and semi-technical scale.		x			x					
56	Interpretation and Visualization of Analytical Data	Fundamentals of computer graphics, cartographic projections, coordinate systems, GPS, and numerical terrain surface models. Application of GIS in analytical chemistry and environmental sciences, spatial data analysis, time series interpretation, and molecular structure visualization. Work with geological and structural databases, interpretation of chemical analysis results, and creation of digital maps and spatial distribution models of substances.					x			x		
57	Waste and Soil Environment Analytics	Types and classification of waste, legal regulations, and methods for identifying pollutant emissions and assessing soil-water environmental conditions. Criteria for waste material recovery, characterization and testing of soil properties, and soil quality standards. Analysis of contaminant migration in soil and groundwater, soil remediation methods, and application of laboratory results for evaluating risks and waste processing potential.					x		x			
58	English Technical and Chemical Terminology I	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialized texts from English, including those related to analytical chemistry in the scope corresponding to Block IV-I.									x	
59	Biomarkers of Oxidative Stress	Chemistry and biology of reactive oxygen and nitrogen species and the concept of oxidative stress. Antioxidant defense mechanisms and oxidative modifications of lipids, proteins, DNA, and RNA. Oxidative stress biomarkers, detection methods, and molecular probes for reactive oxygen and nitrogen species.	x				x					
60	Fluorescence Techniques and Molecular Probes	Fundamental photochemical laws, primary and secondary processes, emissive phenomena (fluorescence, phosphorescence, chemiluminescence), and the Jablonski diagram. Molecular probes (e.g., pyrene derivatives) for environmental property analysis, photoinitiators for polymerization, and applications of photopolymerization in stereolithography, dentistry, and surgery. Fluorescent techniques in biology and medicine: GFP, FRET, heavy metal ion sensors, and functional conjugation of biomolecules with fluorescent dyes.	x				x					
61	Analysis of Polymer Solutions	Polymer solubility, solution physicochemistry, rheology, and methods for determining molecular weights and distributions of macromolecules. Research techniques: viscometry, static and dynamic light scattering, zeta potential measurements, and analysis of kinetics in polymer solutions. Colloid stabilization, studies of particle aggregation, and size distribution analysis of nano- and microparticles using diffraction and scattering methods.										

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
62	Methods for Determining Radioactive Isotopes	Structure and properties of the atomic nucleus, radionuclide classification, radiation types, and kinetics and equilibrium of radioactive decay. Nuclear reactions, natural and artificial radioactivity, interaction of radiation with matter, biological effects, and detection methods and detector types. Radiochemical isotope separation techniques and applications of radioactive isotopes in science, technology, and medicine.	x				x					
63	English Technical and Chemical Terminology II	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialized texts from English, including those related to analytical chemistry in the scope corresponding to Block IV-II.									x	
64	Analysis and Identification of Polymeric Materials	Parameters describing macromolecules, types of additives in polymer materials, sample preparation procedures, and separation techniques. Spectrometric and physicochemical characterization of polymers: IR, Raman, NMR, EPR, XRD, mass spectrometry, thermal analysis, thermal, electrical, optical properties, flammability, chemical resistance, and aging. Surface studies, amorphous phase content determination, particle size measurement, gas and vapor permeability, and laboratory analysis of selected polymers and additives.	x				x					
65	Thermal and Rheological Methods in Polymer Analysis	Types of polymer deformation, stress relaxation, creep, viscoelastic models, and rheological conditions for polymer processing and reinforcement. Thermal and mechanical analysis methods: DSC, DTA, TGA, TMA, DMA for determining phase transitions, thermal stability, viscoelastic properties, and filler activity. Identification and composition analysis of polymer materials, study of curing kinetics, mechanical properties, flow behavior, and aging effects.	x				x					
66	Analysis of Polymers by Spectroscopic Methods	Application of spectroscopic methods (UV-Vis, NIR, MIR, FIR, Raman, NMR, EPR, broadband dielectric spectroscopy) for the qualitative and quantitative analysis of polymeric materials. Studies of the chemical structure, composition of mixtures and composites, intermolecular interactions, phase transitions, orientation, and mobility of macromolecules using modern spectrometers and complementary methods. Analysis of experimental data, utilization of digital databases, and solving research and engineering problems in groups.	x				x					
67	Analysis of the Supramolecular Structures of Molecular Materials	Morphological factors and intermolecular interactions determining supramolecular structure formation and classification of characterization methods. Research techniques: microscopy (polarized optical, AFM, SEM, TEM, ion), diffraction (SAXS, WAXS, GI-SAXS, GI-WAXS), and spectroscopy (Raman, UV-Vis). Analysis of mechanical, electrical, magnetic, and thermal properties and practical application of microscopy and spectroscopy techniques in laboratory exercises.	x				x					
68	English Technical and Chemical Terminology III	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialized texts from English, including those related to analytical chemistry in the scope corresponding to Block IV-III.									x	

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
69	Methods for Separating and Identifying Biomolecules	Types, structure, and properties of biomolecules and their role in cellular processes, along with differences enabling effective separation. Methods for separating biologically relevant compounds: chromatography (column, ion-exchange, RP HPLC, IE HPLC, hydrophobic, affinity), extraction, precipitation, salting-out, electrophoresis, and biopolymer desalting. Biomolecule identification techniques: NMR spectroscopy, GC-MS, LC-MS, MALDI-ToF, composition analysis, and sequencing, combined with practical exercises in separating and identifying amino acids, peptides, and lipids.	x				x					
70	Analysis of Chiral Compounds	Fundamentals of stereochemistry: chirality, conformation, relative and absolute configuration, and physicochemical properties of stereoisomers. Methods for determining configuration and isomeric composition: NMR spectroscopy, chemical correlation, derivatization, and chromatographic techniques using chiral stationary phases. Use of chiral solvating and shift reagents and practical separation and analysis of enantiomers and diastereomers in the laboratory.	x				x					
71	Methods for Identification the Impurity Profiles in the Drug Manufacturing Process	Legal standards governing analytical laboratories and principles of analytical method validation in compliance with Pharmacopoeia VI and manufacturer requirements. Selection of conditions for qualitative and quantitative analysis of biologically active substances in medicinal products using gas and liquid chromatography, including choice of eluent, elution mode, and detector. Design and validation of analytical methods for assessing pharmaceutical product quality, impurities, and impurity profiling as an indicator of manufacturing processes.	x				x					
72	Analysis of Toxic Compounds	Basic concepts and history of toxicology and classes of toxic compounds, including drugs, psychoactive substances, and food additives. Mechanisms of action, metabolism, and interactions of toxic compounds, along with scientific facts and myths about vaccines. Contemporary issues related to toxic substances in the human environment and selected methods for their analysis.	x				x					
73	English Technical and Chemical Terminology IV	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialized texts from English, including those related to analytical chemistry in the scope corresponding to Block IV-IV.									x	
74	Internship	Familiarization with the organizational structure of a company or institute, material management, occupational safety, and environmental management principles. Understanding process automation, control systems, work organization, laboratory technologies, equipment, and applicable standards. Performing tasks under the supervision of an internship mentor, learning the responsibilities of a technologist or research team leader, and establishing professional contacts.			x	x						x
75	Interdisciplinary Project	Independent project execution by a small student group with access to mentor consultations. Application of modern teaching methods: Design Thinking, Flipped Learning, and Problem-Based Learning. Development of creativity, analytical skills, and teamwork through practical problem-solving.										

No.	Course name	Program content	1ACH1	1ACH2	1ACH3	1ACH4	1ACH5	1ACH6	1ACH7	1ACH8	1ACH9	1ACH10
76	Engineering Laboratory	Development of a project directly correlated with the Diploma thesis. As part of the Diploma Seminar, a mandatory Competency exam verifies the achievement of key learning outcomes for the program. The Competency exam is conducted in the form of a case study, and its result becomes part of the overall study assessment in accordance with the Study Regulations of Lodz University of Technology.					x					
77	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					
78	Entrepreneurship and Labor Law	Basics of setting up and running a business with practical knowledge of labor law, principles of planning business ventures, organizational and legal forms of companies and key regulations regarding employment and employer-employee relations, principles of ergonomics.				x						x
79	Startup and Law for Engineers	The process of creating and developing a technology startup, with a focus on the specifics of engineering projects and legal issues related to innovation, product scaling, and technology protection. Regulations regarding technology ownership, contracts in research and development projects, product liability, and certification requirements for technical solutions, occupational health and safety principles, and an introduction to civil and administrative law.				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	General and Inorganic Chemistry I	7			7	
2	Mathematics I	8				
3	Information Technology and Artificial Intelligence	4				
4	Techniques and Methods of Work in the Laboratory	4			4	
5	The Art of Studying	1	1			
6	Machine Science and Engineering Graphics	3		3		
7	Computer-Aided Engineering Design - CAM-CAD	3		3		
8	Environmental Ethics	3	3	3		
9	Art and Chemistry	3	3	3		
10	General and Inorganic Chemistry II	7			7	
11	Mathematics II	6				
12	Physics and Technical Chemistry	7				
13	Introduction to Data Analysis	4				
14	English B2 module I	2		2		
15	English B2+ module I	2		2		
16	English C1 module I	2		2		
17	German B2 module I	2		2		
18	Green Chemistry	2			2	
19	Industrial Property	2		2		
20	Intellectual Property Protection	2		2		

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
21	Organic Chemistry	10			10	
22	Analytical Chemistry	8			8	
23	Physical Chemistry I	5			5	
24	Electrical Engineering with Elements of Electronics	3				
25	Analytical Calculations	2			2	
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	Physical Chemistry II	8			8	
31	Polymers and Composites	5			5	
32	Basics of Biochemistry	3			3	
33	Basics and Validation of Analytical Procedures	7			7	
34	Forensic Chemistry	2			2	
35	Chemometrics	2			2	
36	Electronic Sources of Chemical Information	1				
37	English B2 module III	2		2		
38	English B2+ module III	2		2		
39	English C1 module III	2		2		
40	German B2 module III	2		2		
41	Selected Methods of Instrumental Analysis	6			6	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
42	Trace Analysis and Methods Used in Trace Analysis	3			3	
43	Spectroscopy	5			5	
44	Separation Methods and "omics" Techniques	7			7	
45	English B2 module IV	3		3		
46	English B2+ module IV	3		3		
47	English C1 module IV	3		3		
48	German B2 module IV	3		3		
49	Computational and Simulation Techniques in Chemistry	2				
50	Chemical Sensors and Biosensors	2			2	
51	Analytics and Environmental Monitoring	2				
52	Industrial Analysis and Quality Management Systems	4			4	
53	Summative Module	7		7	7	
54	Electrochemical Analytical Methods	4			4	
55	Analytics of Energy Resources and Biosubstrates	6			6	
56	Interpretation and Visualization of Analytical Data	4			4	
57	Waste and Soil Environment Analytics	3			3	
58	English Technical and Chemical Terminology I	2			2	2
59	Biomarkers of Oxidative Stress	4			4	
60	Fluorescence Techniques and Molecular Probes	4			4	
61	Analysis of Polymer Solutions	2			2	
62	Methods for Determining Radioactive Isotopes	7			7	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
63	English Technical and Chemical Terminology II	2			2	2
64	Analysis and Identification of Polymeric Materials	3			3	
65	Thermal and Rheological Methods in Polymer Analysis	5			5	
66	Analysis of Polymers by Spectroscopic Methods	6			6	
67	Analysis of the Supramolecular Structures of Molecular Materials	3			3	
68	English Technical and Chemical Terminology III	2			2	2
69	Methods for Separating and Identifying Biomolecules	8			8	
70	Analysis of Chiral Compounds	3			3	
71	Methods for Identification the Impurity Profiles in the Drug Manufacturing Process	4			4	
72	Analysis of Toxic Compounds	2			2	
73	English Technical and Chemical Terminology IV	2			2	2
74	Internship	6				
75	Interdisciplinary Project	2		2		
76	Engineering Laboratory	4			4	
77	Engineering Diploma Thesis	15		15	15	
78	Entrepreneurship and Labor Law	3	3	3		
79	Startup and Law for Engineers	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	144/210 (68.57%)

Methods of verifying and assessing learning outcomes

Assessment of learning outcomes is carried out systematically, using a variety of methods adapted to the nature of the subjects and the intended learning outcomes. These include: 1/ Written and oral examinations – a test of theoretical knowledge, the ability to analyze and synthesize information, and problem-solving; 2/ Tests and midterms – ongoing monitoring of learning progress; 3/ Assessment of projects and laboratory work – a test of practical skills, the application of research methods, the interpretation of results, and teamwork; 4/ Presentations and seminars – a test of communication skills, argumentation skills, and the presentation of research results; 5/ Reports and statements – an assessment of data documentation and analysis skills; 6/ Competency-based examination, thesis, and its defense – a comprehensive assessment of learning outcomes, encompassing knowledge, skills, and social competencies; 7/ Active participation in discussions and participation in research projects – an assessment of engagement, independence, and the ability to work in groups. Assessment methods for individual subjects are described in detail in the course cards.

Professional internships

6 ECTS, duration of internship: 6 weeks (after the 4th semester – 2 weeks of professional internship, after the 6th semester – 4 weeks of specialization internship).

Characteristics of the course

Graduate profile

Graduates of the Chemical Analytics program possess advanced knowledge of mathematics, physics, electrical engineering, and chemistry, enabling them to understand physical phenomena and chemical processes, including those occurring in nature. They possess advanced knowledge in the field of chemical analytics, particularly metrology, measurement data quality management, analytical method selection and validation, data analysis and interpretation, and information technology supporting analytical processes. They can discuss issues related to life-cycle analysis of devices, systems, and technical objects, as well as IT solutions used in analytics. They understand the non-technical conditions of engineering activities (social, economic, and legal) and the principles of creating and developing various forms of entrepreneurship. They can independently and collaboratively design and conduct experiments and calculations relevant to the given problem, analyze results from a systemic perspective, and present diverse opinions and perspectives. They can conduct a complete validation of an analytical method, appropriately select and calculate validation parameters, and prepare documentation consistent with quality requirements. They apply the principles of green chemistry in practice, consider reagent disposal, adhere to occupational health and safety regulations, and properly use personal protective equipment. They utilize computer tools to process, visualize, and evaluate chemical data. They possess language skills at a B2 level and are able to acquire and integrate information from scientific literature, databases, and other appropriately selected sources—including those in foreign languages—to solve complex engineering problems and formulate conclusions. They are systematically committed to lifelong learning. They are ready to consciously assume the role of an analytical chemist, undertake critical analysis of information, formulate their own position (including in relation to expert opinions), and act in an entrepreneurial, ethical, and responsible manner, initiating and implementing activities for the development of the social and economic environment.

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

Collaborations with the business community are often well-established and directly translate into internships and placements for students, as well as solutions to real-world problems reported by specialized laboratories as part of their theses. In 2025, the Faculty of Chemistry at Lodz University of Technology, in collaboration with Adamed Pharma, launched the Analyst Academy. This initiative paves the way for the best students to be employed in the company's Quality Control Team. Adamed Pharma's proprietary program allows students to gain valuable professional experience and take up their first job in the pharmaceutical industry. The program is a unique opportunity to gain experience with modern analytical techniques, learn industry best practices, and establish contacts with experts. As part of the program, students participate in classes in laboratories equipped with high-end equipment, such as a Dissolution Robot, HPLC liquid chromatographs, and GC gas chromatographs, enabling detailed physicochemical analyses. The Analyst Academy program responds to the growing demand in the labor market for highly qualified specialists in chemical analytics. Within the program, participants also have the opportunity to learn about quality control in the pharmaceutical industry. After consultations, the program also gained approval from Colian (food industry) and Masdiag (medical diagnostics industry). ● Expanding mobility opportunities for employees, doctoral students, and students of Lodz University of Technology. Students of the Chemical Analytical Sciences program and the faculty of Lodz University of Technology regularly take advantage of opportunities to travel abroad. ● Developing internationalization in education. Lodz University of Technology offers courses and seminars in English to students of the Chemical Analytical Sciences program. ● Modernizing research infrastructure and developing a system for its rational use. Students of Lodz University of Technology have access to specialized equipment and modern laboratories in the chemistry building - Alchemium - The Magic of Tomorrow's Chemistry. ● Implementing clear and fair principles for hiring, remuneration, and career advancement, while taking into account tolerance and equality policies. The recruitment process for Faculty of Chemistry at Lodz University of Technology is based on the OTM-R policy implemented at Lodz University of Technology - "Open, Transparent, Merit-Based Recruitment Process." ● Strengthening the talent management process by individualizing the education paths of undergraduate and graduate students. Talented students in the field of Chemical Analysis can pursue studies within the Individual Study Plan (IPS) and Individual Organization of Studies (IOS) frameworks and participate in Lodz University of Technology mentoring programs, such as E2TOP and Future Studies. ● Supporting the scientific development of undergraduate and graduate students, while emphasizing interdisciplinarity and internationalization; and Increasing student participation in research conducted at the university and intensifying their practical experience outside the university. Students have the opportunity to participate in interdisciplinary research projects - for example, combining topics in chemistry, biology, medicine, materials science, and computer science. They can also participate in foreign trips and exchange programs (Erasmus+), and internships in foreign laboratories. Students also co-author scientific publications with international reach. In summary, thanks to the implementation of these initiatives, the Chemical Analytics program aligns with the strategy of Lodz University of Technology, offering students a high-quality education and preparing them for the demands of the job market.

Educational objectives and employment and continuing education opportunities

The goal of the Chemical Analytics program is to prepare graduates for the profession of analytical chemical engineers possessing advanced knowledge in chemistry and chemical analytics. They are analytical chemists who can apply their knowledge and skills to the analysis of various chemical substances, including characterizing their physicochemical properties using modern instrumental methods. They are chemists who can develop analytical procedures, supervise their implementation, and organize safe and ergonomic workstations, taking into account quality, economic, legal, and ethical requirements. They are also analytical

pracy, uwzględniając wymagania jakościowe, ekonomiczne, prawne i etyczne. Chemika analityka, który potrafi również postępować z substancjami zużyтыми i odpadami, zgodnie z zasadami zrównoważonego rozwoju. Cele obejmują również wykształcenie zdolności korzystania z fachowej literatury i przepisów prawnych, a także posługiwanie się językiem obcym na poziomie B2. Absolwenci kierunku Analityka chemiczna są przygotowani do podjęcia pracy w laboratoriach analitycznych branży chemicznej i pokrewnych, a także do prowadzenia własnej działalności gospodarczej. Mogą kontynuować naukę na studiach II stopnia oraz studiach podyplomowych. chemists who can manage waste and used substances in accordance with the principles of sustainable development. The goals also include developing the ability to use professional literature and legal regulations, as well as to speak a foreign language at a B2 level. Graduates of the Chemical Analytics program are prepared to work in analytical laboratories in the chemical and related industries, as well as to run their own businesses. They can continue their education in second-cycle and postgraduate programs.

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

The concept of education in the Chemical Analytics field was created in response to the socio-economic demand for chemists with extensive competencies in chemical analytics. The Business Council at the Faculty of Chemistry, Lodz University of Technology actively participated in the review process of the prepared study program. The Business Council includes representatives of the following companies: Atlas sp. z o.o., CDM sp. z o.o., Corning Cable Systems Polska sp. z o.o., Krajowa Grupa Spożywcza S.A., Lubawa S.A., Polfarmex S.A., Adamed Pharma S.A., Delia Cosmetics sp. z o.o., Petecki sp. z o.o., QWERTY sp. z o.o., Hitachi Energy, KIKGEL sp. z o.o., TomTom Polska, CloudFerro S.A., WITKO sp. as well as representatives of the Business Centre Club, the Lodz Regional Development Agency, the Investor Service and International Cooperation Office of the City of Lodz, the Polish Forensic Society, and the Forensic Laboratory of the Provincial Police Headquarters in Lodz. Collaboration with the socio-economic community in the educational process takes place on many levels and includes: conducting classes, supervising students during their internships, acquiring materials for theses, and reviewing the study program, primarily in terms of learning outcomes. The cooperation also aims to improve the program's education; to connect the needs and expectations of external entities with student education; to link research with the needs of the external community; and to jointly implement teaching, research, and outreach projects. The study program received positive written opinions from the Business Council of the Faculty of Chemistry of Lodz University of Technology, Colian sp. z o.o., and Masdiac sp. z o.o.

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
General and Inorganic Chemistry I	Tutorials: 60 Lecture: 45	7	Exam	Obligatory
Mathematics I	Tutorials: 45 Lecture: 45	8	Exam	Obligatory
Information Technology and Artificial Intelligence	Laboratory classes: 45 E-learning: 15	4	Graded assignment	Obligatory
Techniques and Methods of Work in the Laboratory	Laboratory classes: 45 Lecture: 15	4	Graded assignment	Obligatory
The Art of Studying	Lecture: 15	1	Graded assignment	Obligatory
Elective Courses 1		3	Graded assignment	Obligatory group
The student chooses one course from the group.				
Machine Science and Engineering Graphics	Project work: 15 Lecture: 15	3	Graded assignment	Optional
Computer-Aided Engineering Design - CAM-CAD	Project work: 15 Lecture: 15	3	Graded assignment	Optional
Elective Courses 2		3	Graded assignment	Obligatory group
The student chooses one course from the group.				
Environmental Ethics	Project work: 15 Lecture: 15	3	Graded assignment	Optional
Art and Chemistry	Project work: 15 Lecture: 15	3	Graded assignment	Optional
Sum	390	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
General and Inorganic Chemistry II	Tutorials: 15 Laboratory classes: 45 Lecture: 30	7	Exam	Obligatory
Mathematics II	Tutorials: 45 Lecture: 45	6	Exam	Obligatory
Physics and Technical Chemistry	Tutorials: 30 Laboratory classes: 45 Lecture: 30	7	Exam	Obligatory
Introduction to Data Analysis	Laboratory classes: 30 Lecture: 30	4	Graded assignment	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
Green Chemistry	Seminar: 10 Project work: 10 Lecture: 10	2	Graded assignment	Obligatory
Elective Courses 3		2	Graded assignment	Obligatory group
The student chooses one course from the group.				
Industrial Property	Project work: 5 Lecture: 10	2	Graded assignment	Optional
Intellectual Property Protection	Project work: 5 Lecture: 10	2	Graded assignment	Optional
Sum	450	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Organic Chemistry	Tutorials: 30 Laboratory classes: 60 Lecture: 60	10	Exam	Obligatory
Analytical Chemistry	Seminar: 15 Laboratory classes: 60 Lecture: 30	8	Exam	Obligatory
Physical Chemistry I	Tutorials: 30 Lecture: 30	5	Exam	Obligatory
Electrical Engineering with Elements of Electronics	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obligatory
Analytical Calculations	Tutorials: 30	2	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	450	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physical Chemistry II	Tutorials: 30 Laboratory classes: 30 Lecture: 30	8	Exam	Obligatory
Polymers and Composites	Laboratory classes: 20 Project work: 20 Lecture: 20	5	Graded assignment	Obligatory
Basics of Biochemistry	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obligatory
Basics and Validation of Analytical Procedures	Laboratory classes: 15 Project work: 45 Lecture: 30	7	Graded assignment	Obligatory
Forensic Chemistry	Seminar: 10 Project work: 5 Lecture: 15	2	Graded assignment	Obligatory
Chemometrics	Laboratory classes: 30	2	Graded assignment	Obligatory
Electronic Sources of Chemical Information	Laboratory classes: 15	1	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
Sum	405	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Selected Methods of Instrumental Analysis	Laboratory classes: 60 Lecture: 30	6	Exam	Obligatory
Trace Analysis and Methods Used in Trace Analysis	Laboratory classes: 20 Project work: 10 Lecture: 15	3	Graded assignment	Obligatory
Spectroscopy	Seminar: 2 Laboratory classes: 40 Lecture: 43	5	Exam	Obligatory
Separation Methods and "omics" Techniques	Laboratory classes: 15 Project work: 30 Lecture: 45	7	Exam	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
Computational and Simulation Techniques in Chemistry	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory
Chemical Sensors and Biosensors	Laboratory classes: 10 Project work: 10 Lecture: 10	2	Graded assignment	Obligatory
Analytics and Environmental Monitoring	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory
Sum	430	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Industrial Analysis and Quality Management Systems	Seminar: 15 Laboratory classes: 25 Lecture: 20	4	Exam	Obligatory
Summative Module	Project work: 90	7	Graded assignment	Obligatory subjects to choose from
Elective Course Block 1		19	Exam/Graded assignment	Obligatory group
The student chooses 1 block.				
Block 1.1		19	Exam/Graded assignment	Optional
Electrochemical Analytical Methods	Laboratory classes: 15 Lecture: 15	4	Graded assignment	Obowiązkowe w bloku
Analytics of Energy Resources and Biosubstrates	Laboratory classes: 30 Project work: 15 Lecture: 30	6	Exam	Obowiązkowe w bloku
Interpretation and Visualization of Analytical Data	Laboratory classes: 30 Project work: 15 Lecture: 15	4	Graded assignment	Obowiązkowe w bloku
Waste and Soil Environment Analytics	Laboratory classes: 30 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
English Technical and Chemical Terminology I	Tutorials: 30	2	Graded assignment	Obowiązkowe w bloku
Block 1.2		19	Exam/Graded assignment	Optional
Biomarkers of Oxidative Stress	Project work: 15 Lecture: 15	4	Graded assignment	Obowiązkowe w bloku
Fluorescence Techniques and Molecular Probes	Laboratory classes: 30 Lecture: 30	4	Exam	Obowiązkowe w bloku
Analysis of Polymer Solutions	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obowiązkowe w bloku
Methods for Determining Radioactive Isotopes	Tutorials: 15 Laboratory classes: 30 Lecture: 45	7	Graded assignment	Obowiązkowe w bloku

Course	Number of hours	ECTS points	Form of verification	Obligatory
English Technical and Chemical Terminology II	Tutorials: 30	2	Graded assignment	Obowiązkowe w bloku
Block 1.3		19	Exam/Graded assignment	Optional
Analysis and Identification of Polymeric Materials	Laboratory classes: 15 Lecture: 30	3	Exam	Obowiązkowe w bloku
Thermal and Rheological Methods in Polymer Analysis	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Obowiązkowe w bloku
Analysis of Polymers by Spectroscopic Methods	Laboratory classes: 15 Project work: 15 Lecture: 30	6	Graded assignment	Obowiązkowe w bloku
Analysis of the Supramolecular Structures of Molecular Materials	Laboratory classes: 15 Lecture: 30	3	Graded assignment	Obowiązkowe w bloku
English Technical and Chemical Terminology III	Tutorials: 30	2	Graded assignment	Obowiązkowe w bloku
Block 1.4		19	Exam/Graded assignment	Optional
Methods for Separating and Identifying Biomolecules	Seminar: 15 Laboratory classes: 75 Lecture: 30	8	Exam	Obowiązkowe w bloku
Analysis of Chiral Compounds	Laboratory classes: 15 Lecture: 15	3	Graded assignment	Obowiązkowe w bloku
Methods for Identification the Impurity Profiles in the Drug Manufacturing Process	Project work: 15 Lecture: 15	4	Graded assignment	Obowiązkowe w bloku
Analysis of Toxic Compounds	Seminar: 10 Lecture: 20	2	Graded assignment	Obowiązkowe w bloku
English Technical and Chemical Terminology IV	Tutorials: 30	2	Graded assignment	Obowiązkowe w bloku
Sum	390	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 Laboratory	Seminar: 15 Project work: 75	4	Graded assignment + exam	Obligatory
Engineering Diploma Thesis	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Elective Courses 4		3	Graded assignment	Obligatory group
The student chooses one course from the group.				
Entrepreneurship and Labor Law	Seminar: 30 Lecture: 15	3	Graded assignment	Optional
Startup and Law for Engineers	Seminar: 30 Lecture: 15	3	Graded assignment	Optional
Sum	165	30		