



Lodz University
of Technology

Study programme

Faculty: Faculty of Chemistry
Major: 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:	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:	2715
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:	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	1CHM1	Has an advanced knowledge and understanding of physical phenomena and chemical processes that constitute the basic knowledge in the field of chemical sciences, necessary to understand issues in the field of mathematics, physics, electrical engineering and chemistry.	P6U_W	P6S_WG
2	1CHM2	At an advanced level, knows and understands the principles of chemical terminology and nomenclature relating to the determination of the structure, basic properties and reactivity of elements and chemical compounds.	P6U_W	P6S_WG
3	1CHM3	Characterizes, and selects research methods and technologies for solving complex and atypical chemical problems; critically evaluates analysis results by integrating information and performing an appraisal of the findings, including through the use of advanced information and communication technologies.	P6U_W	P6S_WG
4	1CHM4	Describes and explains chemical, physicochemical, and biochemical mechanisms, phenomena, and processes.	P6U_W	P6S_WG
5	1CHM5	Knows and describes the principles of safe handling of chemicals, the selection and disposal of chemical waste, and the rational use of natural and human-made resources, including the fundamental processes occurring across the life cycle of devices, facilities, and technical systems.	P6U_W	P6S_WG
6	1CHM6	Knows the issues necessary to understand the social, economic, legal and other non-technical conditions of engineering activities and the principles of creating and developing various forms of entrepreneurship, including individual entrepreneurship.	P6U_W	P6S_WK
7	1CHM7	Is able to develop and conduct appropriate calculations, chemical and physicochemical experiments and simulations using appropriately selected research methods, and to analyze and interpret data, including assessing the reliability of test results, recognizing systemic and non-technical aspects of undertaken activities, and presenting and evaluating various opinions and positions during discussions.	P6U_U	P6S_UW, P6S_UK, P6S_UO
8	1CHM8	Is able to independently and in a team identify, formulate, and solve complex engineering problems in the field of chemistry, including in the context of continuous self-improvement; address the construction, operation, and design of chemical processes and equipment as needed with the use of computer-aided tools; identify errors in planned and executed activities and effectively prevent them; and apply BHP principles.	P6U_U	P6S_UW, P6S_UK, P6S_UO

No.	Learning outcome code	Learning Outcome Content	Reference to the universal characteristics of the first level of PRK	Reference to the second-level characteristics of the PRK, taking into account the second-level characteristics enabling the acquisition of engineering competences
9	1CHM9	Is able to obtain information from literature, databases and other appropriately selected sources, also in a foreign language; communicates with various target groups in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages; also uses specialist chemical terminology in a foreign language.	P6U_U	P6S_UW, P6S_UK, P6S_UU
10	1CHM10	Is prepared to work by applying acquired knowledge while adhering to legal and ethical principles; to critically present the outcomes of their work, conduct self-assessment and peer assessment, as well as evaluate risks and the impacts of engineering activities.	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	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
1	General and Inorganic Chemistry I	Basic concepts, laws, and definitions. Chemical phenomena and balanced equations. Inorganic compounds and isotopes.	x	x					x	x		
2	Mathematics I	Number sequences, limits, and differential calculus of single-variable functions. Limits, derivatives, Taylor and Maclaurin formulas, applications in function analysis and optimization. Integral calculus, complex numbers, matrices, determinants, and systems of linear equations.	x						x			
3	Information Technology	Basics of working with Microsoft Office 365, group collaboration tools, computer operation, Windows 10 configuration and management, local networks and the Internet, HTTP and DNS services, e-services in administration and business, data protection and phishing defense methods. Cloud computing, artificial intelligence, algorithmization, data archiving and encryption, use of Office 365 tools (word processor, spreadsheet, group collaboration), fundamentals of networking and Internet security. Software for chemists: ChemDraw (chemical structure editor) and OriginPro (data analysis, calculations, chart creation).							x	x		
4	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
5	Science of Mechanics, Technical Drawing and Normalisation	Axioms of statics, forces, moments, friction, force systems and equilibrium conditions. Stresses, strength, Hooke's law, bending, shear, torsion, buckling, material fatigue. Center of gravity, moment of inertia, matrices, CAD basics, machine technical drawing.	x							x		x
6	Ethics and Ecology in the Context of Sustainable Development	The natural environment, resources, and global threats: climate change, biodiversity loss, desertification, pollution. Sustainable development, renewable and non-renewable energy sources, and national environmental policy. Models of society: conservation and consumption, the impact of urbanization, demography, and conflict. Principles of environmental ethics and the functioning of fundamental ecological systems. The importance of environmental factors for living organisms and the relationships within populations and biocoenoses. The impact of human activity on the composition and structure of biocoenoses.					x	x				x
7	Business, Ethics and Civilizational Security	Areas of ethical research, key issues, and the relationship between economics and ethics. The moral value of work, professional codes, and ethical standards in management. The concept of social responsibility and ethical aspects of corporate image creation. Principles of environmental ethics. The impact of human activity on the composition and structure of biocoenoses.					x	x				x
8	Physics	Analysis and solving simple physical problems in the field of mechanics, electricity, magnetism and optics.	x						x	x		

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
9	General and Inorganic Chemistry II	Allotropy, polymorphism, and chemical compound isomerism. Properties and applications of elements and compounds, hydrogen isotopes, hydrides, hydrogen bonding, silicon crystal structure. Industrial synthesis of chemical compounds, production of metals and alloys.	x	x					x			
10	Mathematics II	Includes differential and integral calculus of multivariable functions: local/global extrema, double integrals – properties, computation and applications, ordinary differential equations (separable, first-order linear, Bernoulli), second-order linear equations, numerical and functional series. Covers partial derivatives and applications, computing double integrals in various coordinates, solving differential equations, testing series convergence, and expanding functions into Taylor, Maclaurin, and Fourier series. Content includes equation classification, solution methods, radius of convergence of power series, and practical applications of differential and integral calculus.	x						x			
11	Introduction To Data Analysis	Measurement errors, operations on approximate numbers, basics of statistics and probability distributions. Normal and Student's t-distributions, confidence intervals, error propagation, regression and hypothesis testing. Advanced data analysis methods: ANOVA, chi-square test, data smoothing.			x				x			
12	Basics of Good Laboratory Practice and Good Manufacturing	Good Laboratory Practice in non-clinical and preclinical studies, legal regulations, and GMP. Product quality, manufacturer responsibility, basic requirements for medicinal products, quality assurance. Good Manufacturing Practice – general requirements and legal framework.			x		x					
13	Apparatus of the Chemical Industry	Equipment used in the chemical industry and its mechanism of operation.					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; development of all language skills; development and improvement of soft skills focused on the graduate's future work environment.									x	
18	History of Chemistry and Chemical Industry	History and development of chemistry and its impact on civilization. Key stages from alchemy to modern concepts, including nuclear chemistry and environmental protection. Analysis of major theories, discoveries, and their significance for science and technology.						x				x
19	Chemistry and Art	Introduction to art in the context of its connection with chemistry. History of art, monument conservation, and chemistry of materials used in art. Methods of conservation and restoration of historical objects and alchemical references in art.						x				x

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
20	Organic Chemistry I	Structure, nomenclature, and physical and chemical properties of organic compounds. Synthetic methods. Mechanisms of action.		x		x			x	x		
21	Physical Chemistry I	Basic concepts and functions of chemical thermodynamics, laws I-III, criteria of reversibility and spontaneity of processes. Transformations of ideal and real gases, gas laws, thermochemistry, calorimetry, heat transfer mechanisms, statistical thermodynamics. Chemical and phase equilibrium, ideal and real solutions, colligative properties, distillation, azeotropes, extraction.	x		x				x	x		
22	Analytical Chemistry	Classification of chemical analysis methods, their parameters and errors, standardization, and reliability of obtained results. Principles of sampling and preparation of samples for analysis.			x					x		
23	Electrical Engineering with Elements of Electronics	Properties of components in DC and AC electrical and electronic circuits. Basics of electrical measurement and methods for analyzing linear circuits. Operating principles of electrotechnical and electronic devices and their applications in daily life and industry.	x							x		
24	Copyright and Patent Law	Intellectual property and the laws protecting it. Polish legislation and EU directives and international agreements. Copyright and related rights. Copyright at the university. Criminal liability for copyright infringement (the problem of plagiarism). Cyberrevolution of the 20th and 21st centuries and copyright. The idea of free culture (OpenSource, Creative Commons, Copyleft, Wiki, GNU). Database law, industrial property law.						x				
25	Computational and Simulation Techniques in Chemistry	Classification of computational methods and theoretical foundations of ab initio approaches in quantum chemistry. Approximate calculation methods, basis sets, molecular mechanics, and molecular dynamics. Application of HyperChem and Gaussian software in quantum, molecular mechanics, and molecular dynamics calculations.							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; developing all language skills; developing and improving soft skills oriented around 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	Organic Chemistry II	Carboxylic acids and derivatives: structure, preparation, nomenclature, properties, and reactivity. Reactions of enolates and enols, base-catalyzed condensations, malonic synthesis, Michael addition. Structure and synthesis of amines, chemical properties, diazonium salts – synthesis and applications.		x		x			x	x		

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
31	Physical Chemistry II	Phase and chemical equilibrium in real solutions: deviations from Raoult's law, azeotropes, component activity, limited miscibility systems, Nernst distribution law. Electrolyte solutions: ionic strength, Debye-Hückel law, solubility product, conductivity, electrochemical cells, Nernst equation, potentiometry. Reaction kinetics, temperature effect, Arrhenius equation, catalysis, transport and diffusion phenomena, surface tension, adsorption, heterogeneous catalysis.	x		x				x	x		
32	Chemistry of Polymers	The basics of polymer chemistry are presented in correlation with issues related to the synthesis, chemical structure and properties of macromolecular materials.	x							x		
33	Nuclear Chemistry and Radiochemistry	Structure and properties of atomic nuclei, types of radiation, laws of radioactive decay. Radioactive processes, nuclear reactions, isotope formation, radiation-matter interaction, detection methods, and radiochemical techniques. Nuclear energy, fuel cycle, radioactive waste management, applications of isotopes in science, technology, and medicine.	x							x		
34	Toxicity the Chemical Compounds	Basic concepts of toxicology and selected historical aspects. Classes of toxic compounds, mechanisms of action, metabolism, and interactions. Vaccines and their role in toxicology.				x	x					
35	Spectroscopy	Types of spectroscopy, selection rules, and comparison of spectroscopic methods.	x			x				x		
36	Electronic Sources of Chemical Information	Introduction to journal platforms and databases: ACS, Wiley, RCS, Elsevier, Reaxys, SciFinder, Scopus, Web of Science, Knovel, JCS. Building a personal database and creating bibliographies using EndNote Web. Practical use of tools for literature search and citation management.									x	
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	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	
41	Fundamentals of Chemical Technology and Engineering	Chemical technology – development of a technological concept for a process. Unit processes in chemical technology, using the examples of obtaining basic products in chemical plants. Dynamic and thermal operations: flow processes, particle settling, mixing, heat conduction, radiation, and transfer. Diffusion operations: mass transfer laws, distillation, rectification, drying. Fundamentals of heat and mass transport mechanisms in technological processes.	x		x				x	x		

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
42	Chromatographic Methods	Chromatography terminology, principles of separation in partition and adsorption techniques. Gas chromatography: temperature programming, carrier gas, columns, detectors. Qualitative and quantitative analysis: peak measurement, calibration methods, error sources.			x		x			x		
43	Instrumental Analysis	Division of instrumental methods. Calibration methods of instrumental analysis. Division and characteristics of spectroscopic methods. X-ray methods.			x					x		
44	Catalysis	Basic concepts of heterogeneous and homogeneous catalysis, essence of catalytic processes. Activity, selectivity, active sites, types of catalysts, their role, preparation, and physicochemical properties. Catalytic strategies in the synthesis of natural products and biologically important compounds.	x	x								
45	Functional Materials	Classification of materials, types of chemical bonds and their impact on properties. Basics of surface physicochemistry, properties and industrial applications of functional materials, principles of their design. Hierarchical structure of materials and the role of molecular ordering.		x						x		
46	Chemistry of Biologically Active Compounds	Basic concepts of biochemistry, cell structure, organelles and their functions, small and macromolecular compounds. Macromolecular structure-function relationship, genetic information flow, enzymes, metabolic pathways, cellular energy sources. Biological membranes, role of metals in biology, bioinorganic chemistry methods, ion transport, antibiotics, electron-transfer proteins.				x			x	x		
47	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	
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 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	
50	German 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	
51	Chemistry - Engineering of Future	Synthesis of functional materials with precisely defined structure and properties. Strategies for producing materials with various levels of organization for applications in medicine, micro- and nanomechanics, sensing, and flexible electronics. Organic, inorganic, and hybrid systems, along with molecular self-assembly and supramolecular structure formation.			x					x	x	x
52	Green Chemistry	The concept of sustainable development as a perspective for future civilizational progress. Principles of green chemistry and engineering, including Anastas' 12 principles, the atom economy concept, and Winterton's guidelines. Green analytical chemistry, catalysis as a pillar of green chemistry, and life cycle assessment of products.										

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
53	Molecular Gastronomy	Introduction to molecular cuisine combining science, technology, and culinary art, and its role in promoting healthy eating habits. Fundamentals of taste physiology, food components, and chemical processes affecting aroma, color, texture, and structure of dishes. Traditional and modern food processing methods and the application of innovative technologies in gastronomy.			x					x	x	x
54	Nanochemistry	Basic applications of nanomaterials, with a particular focus on medicine. Top-down and bottom-up synthesis methods and major classes of nanomaterials. Techniques for fabrication, analysis, and visualization of nanomaterials, along with health and environmental safety issues.			x					x	x	x
55	Cosmetic Materials	Cosmetic raw materials, including inorganic compounds and lipids: fatty acids, waxes, glycerides, and complex lipids. Polyhydric alcohols, liposomes and their production technology, as well as antioxidants, preservatives, and UV stabilizers. Cosmetic emulsions, their manufacturing technology, and factors affecting stability.			x					x	x	x
56	Polymers From Renewable Resources	Polymers derived from renewable resources, green elastomers, and biomass as a source of green polymers. Impact of polymer structure on oxidation susceptibility, types of degradation, biodegradation, composting, and resistance to environmental factors. Eco-friendly polymer stabilization, plant-based stabilizers, aging testing methods, recycling, and aliphatic polyesters.			x					x	x	x
57	Chemistry of High Molecular Compounds	The course covers the basics of structure, classification, and nomenclature of macromolecular compounds. The mechanisms of polymer synthesis are discussed, along with the main applications and examples of processing of basic synthetic polymers. The physical section considers chain conformation and mobility, the properties of polymer solutions and melts with elements of rheology, phase transitions, and the glassy and crystalline states. Methods for characterizing macromolecules are also an important element.	x		x				x	x		
58	Specialty Polymer Materials	High-strength and heat-resistant polymers: structure-morphology-property relationships, orientation methods, application examples. Polymers in medicine, electrical and thermal insulators; conductive materials: conjugated polymers, conductive composites, micro- and nanocomposites with special properties. Photoconductive and electroluminescent polymers: modification methods, color modulation, applications in electronics, xerography, and optoelectronics.	x		x				x	x		
59	Polymer Testing Methods	Structure, properties, and applications of polymer materials; fractionation methods and molar mass determination; diffraction and microscopy techniques for structural and morphological analysis. Material testing: mechanical, thermal, fire, and electrical properties; spectroscopic and scattering methods for polymer characterization. Analysis of morphology changes under physical factors; thermal and thermomechanical techniques for stability assessment; computational methods and polymer recycling issues.	x		x				x	x		
60	Technology and Processing of Polymers	Polymers: types, structure, properties, applications; blend components and roles (fillers, plasticizers, crosslinking, curing agents). Production and processing methods; crosslinking, vulcanization, spatial network elements. Testing blends and vulcanizates; processing lines (mills, mixers, extruders, calenders, presses, injection machines).	x		x				x	x		

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
61	Specialization Project	Principles of solving engineering problems. Planning and conducting research to address the problem. Discussion of the proposed solution to the engineering problem.								x		
62	English Chemical Terminology IV	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialist texts from English, including the nomenclature of special type of chemical compounds.									x	
63	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.			x	x	x			x		
64	Internship	Familiarization with plant organization, safety regulations, and layout of workstations and process control. Understanding technological aspects: material management, production control, environmental management, equipment monitoring, and quality standards. Sample collection, basic analyses, and performing tasks according to supervisor's guidelines.					x		x	x		x
65	Interdisciplinary Project	Building project teams diversified by chemical interests. Developing projects with commercialization potential. Optional collaboration with university units to prepare commercialization pathways.			x	x	x			x		
66	Final Project	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.										
67	Engineering Laboratory	Individual classes conducted in scientific laboratories of engineering thesis supervisors. Performing experiments related to the diploma thesis topic. Analysis of the obtained research results.										
68	Raw Materials and Chemical Management	Fundamentals of the management of chemical substances and products in economic circulation, including definitions, principles of placing on the market, as well as EU regulations (REACH, CLP) and the GHS system. Analysis of the composition and properties of substances, assessment of compliance with REACH requirements and the possibility of placing a product on the EU market, preparation of selected elements of chemical product documentation.					x	x				
69	The Company of the Future - Quality Management	Integration of quality with digitalization, Industry 4.0, and artificial intelligence. Quality management as a component of sustainable development strategy and transparency in supply chains. Innovation culture and quality personalization as the foundation of competitive advantage for the enterprise of the future.					x	x				
70	Professional Ethics and Fundamentals of Entrepreneurship with Elements of Occupational Health and Safety	Concept of entrepreneurship and business forms; registration documents and freedom of activity. Business financing (business plan), reporting duties, entrepreneur's rights and obligations. Basics of interpersonal communication; enterprise management systems.						x				x

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
71	Law and Fundamentals of Entrepreneurship with Elements of Occupational Health and Safety	History and overview of labor law; sources, employment contract, employment relationship and termination; rights and duties of parties. Working time, leave, wages; dispute resolution; health and safety regulations. Non-standard employment forms, comparison with civil contracts and self-employment; parental rights; collective labor law and social security system.						x				x
72	Methods of Organic Synthesis	Transformation of functional groups, use of protecting groups, and strategies for their selection in organic synthesis. Regio- and stereoselective syntheses, pericyclic reactions, cyclization and heterocyclization, and methods for forming carbon-carbon bonds. Catalytic reactions (homogeneous and heterogeneous), reductions and oxidations, synthesis planning, and strategies for peptide and nucleotide synthesis.	x		x				x	x		
73	Stereochemistry	Spatial structure of organic molecules, identification of chiral compounds, and classification of stereoisomers. Methods for determining enantiomeric excess and separating racemates, conformations of linear and cyclic hydrocarbons. Steric and stereoelectronic effects influencing molecular conformation, including resonance and anomeric effects.	x		x					x		
74	Basics of Medicinal and Combinatorial Chemistry	History of drug discovery and emerging trends and strategies for developing lead compounds and new therapeutic approaches. Key concepts and parameters in medicinal chemistry: lead structure, pharmacophore, Lipinski's rules, logP, pKa, ADMET, and drug administration and transport routes. Drug action mechanisms, types of inhibitors, importance of chirality, and characteristics of ligand-receptor and ligand-enzyme interactions.	x		x				x	x		
75	Biocatalysis in Chemical Synthesis	Characteristics of biocatalysts and biotransformation reactions, along with conditions for conducting these processes. Improvement of enzyme properties to enhance catalytic activity, stability, and stereoselectivity. Application of biotransformation in organic synthesis using isolated enzymes and whole organisms, particularly in asymmetric synthesis and the production of biologically active compounds.	x		x				x	x		
76	Methods of Separation and Identification of Organic Compounds	Modern separation techniques: gas chromatography, high-performance liquid chromatography, and their coupling with mass spectrometry and NMR spectroscopy. Fundamentals of mass spectrometry: ionization methods, ion separation, spectrum interpretation, and main fragmentation pathways; IR and NIR spectroscopy and the influence of molecular structure on chemical shifts. One- and two-dimensional NMR spectroscopy, including correlation spectra such as COSY, HMQC, HMBC, and NOESY.	x		x				x	x		
77	English Chemical Terminology II	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialist texts from English, including the nomenclature of special type of chemical compounds.										x
78	Industrial Analytical Chemistry	Objectives and tasks of industrial analysis, methods for process and quality control, and standardization of procedures. Organization of work in an industrial laboratory, documentation, sampling, storage, and sample decomposition. General analyses in selected industrial sectors, principles of standardization, and accreditation of analytical laboratories.	x		x				x	x		

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
79	Separation Techniques in Quality Control	Separation techniques for complex matrix sample analysis: one- and multidimensional gas chromatography and multicapillary chromatography. Coupled techniques and hyphenated methods (GC-MS, GC-MS-MS, GC-IR, LC-MS, LC-NMR), their types, advantages, selection criteria, and applications in quality control. Interpretation of measurement results, sources of uncertainty, and modern instruments used for complex sample analysis.	x		x				x			
80	Quality Control in Chemistry and Chemical Industry	Quality control requirements in chemistry, characteristics of analytical methods, and calibration of laboratory instruments. Selection of analytical methods, quality assurance systems, measurement traceability, reference materials, and estimation of measurement uncertainty. Quality control in production processes, process performance analysis, statistical quality control, and process management using control charts.	x		x				x	x		
81	Trace Analysis in Quality Control and Forensic Chemistry	Fundamental issues of trace analysis and analytical methods used in quality control. Quality assurance systems in analytical and forensic laboratories, basics of forensic chemistry, and forensic techniques. Types of traces, their collection and preservation, physicochemical examination of microtraces, and chemical and physical methods applied in forensic investigations.	x		x				x	x		
82	Environmental Quality Measurement Methods and the Monitoring of Water and Wastewater	Characteristics and sources of environmental pollutants and methods for their separation and determination in environmental samples. Basics of environmental monitoring, principles of quality assessment, indicators, norms, and applicable standards. Interpretation and presentation of environmental data and practical applications of analysis in ecosystem protection.	x		x				x	x		
83	English Chemical Terminology I	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialist texts from English, including the nomenclature of special type of chemical compounds.									x	
84	An Introduction to Medicinal Chemistry and Molecular Biology	Cell structure, drug targets (lipids, proteins, nucleic acids), and cell signaling involving hormones, neurotransmitters, and receptors. Drug-receptor interaction mechanisms (agonists, antagonists, partial and inverse agonists) and signal transduction pathways via enzymatic receptors, ion channels, and G-protein-coupled receptors. Aspects of drug metabolism, toxicity, prodrugs, and the relationship between biological activity and physicochemical properties in drug design.	x		x				x	x		
85	Basics of Biopharmaceutics and Pharmacokinetics and Drug Design	Fundamentals of pharmacokinetics and pharmacodynamics and the fate of a drug in the body (LADME) influenced by physicochemical and physiological factors. Pharmacokinetic models and parameters for intravenous and extravascular administration, calculations in one- and two-compartment models, and during intravenous infusion. Bioavailability and its determination methods, along with pharmacokinetic-pharmacodynamic relationships.	x		x				x	x		
86	Biomaterials and Medical Nanotechnology	Basics of biomaterials: history, applications, biocompatibility, regulations, and properties of medical materials (metals, ceramics, glass, polymers). Synthetic and natural polymers, structure, properties, hydrogels, surface characterization and modifications, biodegradable polymers. Tissue engineering, controlled drug release systems, sterilization, biofilms, SAL, and radiation engineering of biomaterials.	x		x				x	x		

No.	Course name	Program content	1CHM1	1CHM2	1CHM3	1CHM4	1CHM5	1CHM6	1CHM7	1CHM8	1CHM9	1CHM10
87	Chemical Foundations of Medical Diagnostics	Cell structure and drug targets: lipids, proteins, nucleic acids. Cellular signaling and drug-receptor interactions: hormones, neurotransmitters, receptors; agonists, antagonists, partial and inverse agonists. Drug metabolism and design: toxicity, prodrugs, relationship between biological activity and physicochemical properties; examples of new drug design.	x		x				x	x		
88	Specialization Project	Principles of solving engineering problems. Planning and conducting research to address the problem. Discussion of the proposed solution to the engineering problem.								x		
89	English Chemical Terminology III	Working with English-language scientific literature and communicating effectively in an international academic environment. Laboratory terminology. Translations of specialist texts from English, including the nomenclature of special type of chemical compounds.									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	10			10	
2	Mathematics I	8				
3	Information Technology	5				
4	The Art of Studying	1				
5	Science of Mechanics, Technical Drawing and Normalisation	3				
6	Ethics and Ecology in the Context of Sustainable Development	3	3	3		
7	Business, Ethics and Civilizational Security	3	3	3		
8	Physics	6				
9	General and Inorganic Chemistry II	5			5	
10	Mathematics II	6				
11	Introduction To Data Analysis	4				
12	Basics of Good Laboratory Practice and Good Manufacturing	2				
13	Apparatus of the Chemical Industry	3			3	
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	History of Chemistry and Chemical Industry	2	2	2		
19	Chemistry and Art	2	2	2		
20	Organic Chemistry I	9			9	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
21	Physical Chemistry I	7			7	
22	Analytical Chemistry	6			6	
23	Electrical Engineering with Elements of Electronics	2			2	
24	Copyright and Patent Law	2				
25	Computational and Simulation Techniques in Chemistry	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	Organic Chemistry II	8			8	
31	Physical Chemistry II	8			8	
32	Chemistry of Polymers	3			3	
33	Nuclear Chemistry and Radiochemistry	2				
34	Toxicity the Chemical Compounds	2			2	
35	Spectroscopy	4			4	
36	Electronic Sources of Chemical Information	1			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	Fundamentals of Chemical Technology and Engineering	7			7	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
42	Chromatographic Methods	3			3	
43	Instrumental Analysis	5			5	
44	Catalysis	2			2	
45	Functional Materials	4			4	
46	Chemistry of Biologically Active Compounds	4			4	
47	English B2 module IV	3		3		
48	English B2+ module IV	3		3		
49	English C1 module IV	3		3		
50	German B2 module IV	3		3		
51	Chemistry - Engineering of Future	2		2	2	
52	Green Chemistry	2		2	2	
53	Molecular Gastronomy	2		2	2	
54	Nanochemistry	2		2	2	
55	Cosmetic Materials	2		2	2	
56	Polymers From Renewable Resources	2		2	2	
57	Chemistry of High Molecular Compounds	8		8	8	
58	Specialty Polymer Materials	4		4	4	
59	Polymer Testing Methods	5		5	5	
60	Technology and Processing of Polymers	2		2	2	
61	Specialization Project	3		3	3	
62	English Chemical Terminology IV	1		1	1	1

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
63	Summative Module	7		7	7	
64	Internship	6				
65	Interdisciplinary Project	2		2		
66	Final Project	15		15	15	
67	Engineering Laboratory	3			3	
68	Raw Materials and Chemical Management	2		2	2	2
69	The Company of the Future - Quality Management	2		2	2	2
70	Professional Ethics and Fundamentals of Entrepreneurship with Elements of Occupational Health and Safety	2		2	2	
71	Law and Fundamentals of Entrepreneurship with Elements of Occupational Health and Safety	2		2	2	
72	Methods of Organic Synthesis	7		7	7	
73	Stereochemistry	2		2	2	
74	Basics of Medicinal and Combinatorial Chemistry	4		4	4	
75	Biocatalysis in Chemical Synthesis	2		2	2	
76	Methods of Separation and Identification of Organic Compounds	7		7	7	
77	English Chemical Terminology II	1		1	1	1
78	Industrial Analytical Chemistry	4		4	4	
79	Separation Techniques in Quality Control	8		8	8	
80	Quality Control in Chemistry and Chemical Industry	3		3	3	
81	Trace Analysis in Quality Control and Forensic Chemistry	3		3	3	
82	Environmental Quality Measurement Methods and the Monitoring of Water and Wastewater	4		4	4	

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
83	English Chemical Terminology I	1		1	1	1
84	An Introduction to Medicinal Chemistry and Molecular Biology	5		5	5	
85	Basics of Biopharmaceutics and Pharmacokinetics and Drug Design	4		4	4	
86	Biomaterials and Medical Nanotechnology	4		4	4	
87	Chemical Foundations of Medical Diagnostics	6		6	6	
88	Specialization Project	3		3	3	
89	English Chemical Terminology III	1		1	1	1

ECTS indicators

Name	Diploma Path: Chemistry of Polymeric Materials	Diploma Path: Organic and Bioorganic Synthesis	Diploma Path: Quality Control in Chemistry	Diploma Path: Biomedical Chemistry
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)	67/210 (31.9%)	67/210 (31.9%)	67/210 (31.9%)	67/210 (31.9%)
The total number of ECTS credits to be earned by a student through courses in the fields of humanities or social sciences	5	5	5	5
The total number of ECTS credits that a student must obtain from courses related to research conducted at the university, amounting to more than 50% of the total ECTS credits required to graduate from a given level of study	147/210 (70%)	147/210 (70%)	147/210 (70%)	147/210 (70%)

Methods of verifying and assessing learning outcomes

Verification of achieved learning outcomes requires the use of diverse forms of student assessment, appropriate to the categories of knowledge, skills, and social competences to which these outcomes relate. The selection of appropriate tools also depends on the specifics of the subject and the form of instruction, and is described each time in the course syllabi. The achievement of required learning outcomes is assessed through: 1. written assignments (exams, tests, reports, essays, projects, posters, diploma theses, etc.); 2. oral statements (oral examinations of knowledge, public speaking such as delivering papers, presentations, etc.); 3. practical and/or project-based tasks (team and individual); 4. observation and evaluation of students' activity during classes; 5. self-assessment and peer assessment (especially in team projects); 6. competency examinations and the diploma examination. Assessment may be formative (partial, conducted multiple times during the course) and/or summative (final grade). The final assessment result is provided according to the currently applicable grading scale. The course coordinator or instructor is required, during the first class, to discuss the course syllabus and to define and formally communicate to students the methods of assessment and the conditions for verifying the achievement of learning outcomes.

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).

Specializations/degree paths offered within the study program

Diploma Path: Chemistry of Polymeric Materials

Diploma Path: Organic and Bioorganic Synthesis

Diploma Path: Quality Control in Chemistry

Diploma Path: Biomedical Chemistry

Characteristics of the course

Graduate profile

Graduates in Chemistry possess advanced and structured knowledge of general, inorganic, organic, and physical chemistry, as well as chemical technology, based on the fundamentals of mathematics, physics, and the natural sciences. They can analyze physicochemical phenomena and technological processes, interpret research results, and apply computational, analytical, and technological methods to solve engineering problems. They design and supervise chemical processes, including environmentally friendly ones, while considering the principles of safety, efficiency, and sustainability. They select tools and techniques for engineering tasks, assess the risk and effectiveness of solutions, and organize safe workstations. They utilize professional literature, standards, and legal regulations in the field of chemical sciences, communicate effectively in a professional environment, and collaborate within a team carrying out assigned tasks. They make decisions with consideration of economic, legal, and ethical aspects and develop their competencies through lifelong learning. Graduates are prepared to work in chemical and related industries, research laboratories, regulatory institutions, and to run their own businesses. Can continue their studies in second-cycle and postgraduate studies.

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

The Chemistry program is aligned with the Lodz University of Technology's strategy for 2025-2030 (<https://p.lodz.pl/uczelnia/strategia-uczelni>), the primary goal of which is to develop a model of education that prepares graduates for the dynamically changing needs of the socio-economic environment. The Chemistry program pursues the following strategic goals of Lodz University of Technology: ● Supporting research that addresses socio-economic challenges. Chemistry students are engaged in research projects related to the industrial sector. ● Developing mobility opportunities for employees, doctoral candidates, and students of Lodz University of Technology. Chemistry students and faculty of the Faculty of Chemistry at Lodz University of Technology regularly take advantage of opportunities to travel abroad. ● Developing internationalization in education. The Faculty of Chemistry offers Chemistry students courses and seminars in English. ● Conducting useful, socially and environmentally responsible research that supports a knowledge-based economy and fosters interdisciplinary research through the development of collaboration between disciplines and fields of science. Students have the opportunity to conduct industry-related research that addresses social and environmental needs and supports a knowledge-based economy. The Chemistry program is consulted with the Business Council at the Faculty of Chemistry, ensuring its compliance with the requirements of the labor market. Degree paths, such as Chemistry of Polymer Materials and Biomedical Chemistry, are interdisciplinary in nature, integrating various fields of science. ● Modernization of research infrastructure and the development of a system for its rational use. Students of the Faculty of Chemistry at Lodz University of Technology have access to specialized equipment and modern laboratories in the chemistry building – Alchemium – The Magic of Tomorrow's Chemistry. ● Implementation of clear and fair principles for hiring, remuneration, and career advancement, while respecting tolerance and equality policies. The recruitment process for the Faculty of Chemistry at Lodz University of Technology is based on the OTM-R policy – "Open, Transparent, Merit-Based Recruitment Process." ● Continuous improvement of academic teachers' competencies in modern teaching methods, the current state of knowledge, technological developments, and scientific trends. Academic teachers involved in teaching in the Chemistry program actively participate in numerous training courses, enhancing their qualifications, including in modern teaching methods. ● Improving the educational offer, including supplementary forms of education, in response to the challenges of the socio-economic environment. The Business Council at the Faculty of Chemistry has a real influence on the shape of the Chemistry program, which responds to socio-economic challenges. ● Strengthening the talent management process by individualizing the education paths of undergraduate and doctoral students. Talented students can pursue studies within the IPS and IOZ programs and participate in TUL's mentoring programs, such as E2TOP. ● Supporting the scientific development of undergraduate and graduate students, with an emphasis on 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, such as Erasmus+, and internships in foreign laboratories. Students are also co-authors of scientific publications with international reach. In summary, thanks to the implementation of these initiatives, the Chemistry program aligns with Lodz University of Technology's strategy, offering students the highest level of education and preparing them for the demands of the job market.

Educational objectives and employment and continuing education opportunities

The educational objectives of the Chemistry major include preparing students to solve engineering problems in chemistry and chemical technology by acquiring advanced and structured theoretical knowledge and developing practical skills. The curriculum provides a thorough foundation in general, inorganic, physical, and organic chemistry, supplemented with knowledge in specialized areas such as

analytical chemistry, biomedical chemistry, organic synthesis, and polymer chemistry. A key element of the education is developing skills in independent laboratory work, designing and implementing technological processes, and applying analytical and computational methods. The curriculum is aligned with the requirements of the Polish Qualifications Framework, encompassing topics in mathematics, physics, and chemical technology, ensuring interdisciplinary preparation for work in a modern professional environment. Studies in the Chemistry major offer a choice of diploma paths, such as: Quality Control in Chemistry, Organic and Bioorganic Synthesis, Biomedical Chemistry, and Chemistry of Polymer Materials, allowing students to deepen their knowledge in their chosen area and tailor their competencies to their planned career. The curriculum also focuses on developing social competencies, such as making responsible decisions and adhering to ethical and legal principles in professional activities. The aim of the program is to prepare students for professional activity in the chemical, biotechnology, pharmaceutical, and related industries, and to lay the foundation for further development through continuing 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 undergraduate Chemistry program was created in response to the socio-economic needs of the environment for chemists. The Business Council at the Faculty of Chemistry, Lodz University of Technology actively participated in the process of reviewing 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 align 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 and ChemiPack 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: 40 Laboratory classes: 45 Lecture: 60	10	Exam	Obligatory
Mathematics I	Tutorials: 45 Lecture: 45	8	Exam	Obligatory
Information Technology	Laboratory classes: 40 Lecture: 20	5	Graded assignment	Obligatory
The Art of Studying	Lecture: 15	1	Graded assignment	Obligatory
Science of Mechanics, Technical Drawing and Normalisation	Project work: 15 Lecture: 15	3	Graded assignment	Obligatory
Elective Courses 1		3	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Ethics and Ecology in the Context of Sustainable Development	Seminar: 15 Lecture: 15	3	Graded assignment	Optional
Business, Ethics and Civilizational Security	Seminar: 15 Lecture: 15	3	Graded assignment	Optional
Sum	370	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physics	Tutorials: 30 Laboratory classes: 40 Lecture: 30	6	Exam	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
General and Inorganic Chemistry II	Tutorials: 45 Lecture: 30	5	Exam	Obligatory
Mathematics II	Tutorials: 45 Lecture: 45	6	Exam	Obligatory
Introduction To Data Analysis	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Obligatory
Basics of Good Laboratory Practice and Good Manufacturing	Project work: 15 Lecture: 5	2	Graded assignment	Obligatory
Apparatus of the Chemical Industry	Laboratory classes: 5 Project work: 10 Lecture: 15	3	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
Elective Courses 2		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
History of Chemistry and Chemical Industry	Seminar: 15	2	Graded assignment	Optional
Chemistry and Art	Seminar: 15	2	Graded assignment	Optional
Sum	450	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Organic Chemistry I	Tutorials: 30 Laboratory classes: 30 Lecture: 60	9	Exam	Obligatory
Physical Chemistry I	Tutorials: 30 Laboratory classes: 30 Lecture: 30	7	Exam	Obligatory
Analytical Chemistry	Laboratory classes: 60 Lecture: 15	6	Graded assignment	Obligatory
Electrical Engineering with Elements of Electronics	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory
Copyright and Patent Law	Seminar: 15 Lecture: 15	2	Graded assignment	Obligatory
Computational and Simulation Techniques in Chemistry	Laboratory classes: 15 Lecture: 15	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	435	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Organic Chemistry II	Tutorials: 30 Laboratory classes: 60 Lecture: 20	8	Exam	Obligatory
Physical Chemistry II	Tutorials: 30 Laboratory classes: 45 Lecture: 30	8	Exam	Obligatory
Chemistry of Polymers	Laboratory classes: 15 Lecture: 30	3	Graded assignment	Obligatory
Nuclear Chemistry and Radiochemistry	Seminar: 5 Laboratory classes: 13 Lecture: 12	2	Graded assignment	Obligatory
Toxicity the Chemical Compounds	Seminar: 5 Lecture: 10	2	Graded assignment	Obligatory
Spectroscopy	Laboratory classes: 30 Lecture: 20	4	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	430	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Fundamentals of Chemical Technology and Engineering	Tutorials: 15 Laboratory classes: 35 Lecture: 40	7	Exam	Obligatory
Chromatographic Methods	Laboratory classes: 30 Lecture: 15	3	Exam	Obligatory
Instrumental Analysis	Laboratory classes: 40 Lecture: 20	5	Exam	Obligatory
Catalysis	Lecture: 30	2	Graded assignment	Obligatory
Functional Materials	Project work: 30 Lecture: 15	4	Graded assignment	Obligatory
Chemistry of Biologically Active Compounds	Laboratory classes: 10 Project work: 10 Lecture: 40	4	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		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Chemistry - Engineering of Future	Project work: 10 Lecture: 5	2	Graded assignment	Optional
Green Chemistry	Project work: 10 Lecture: 5	2	Graded assignment	Optional
Molecular Gastronomy	Project work: 10 Lecture: 5	2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
Nanochemistry	Project work: 10 Lecture: 5	2	Graded assignment	Optional
Cosmetic Materials	Project work: 10 Lecture: 5	2	Graded assignment	Optional
Polymers From Renewable Resources	Project work: 10 Lecture: 5	2	Graded assignment	Optional
Sum	375	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Summative Module	Project work: 90	7	Graded assignment	Obligatory subjects to choose from
Sum	90	7		

Diploma Path: Quality Control in Chemistry

Course	Number of hours	ECTS points	Form of verification	Obligatory
Industrial Analytical Chemistry	Laboratory classes: 30 Project work: 10 Lecture: 30	4	Exam	Obligatory specialization courses
Separation Techniques in Quality Control	Laboratory classes: 60 Lecture: 30	8	Graded assignment	Obligatory specialization courses
Quality Control in Chemistry and Chemical Industry	Laboratory classes: 15 Project work: 15 Lecture: 30	3	Exam	Obligatory specialization courses

Course	Number of hours	ECTS points	Form of verification	Obligatory
Trace Analysis in Quality Control and Forensic Chemistry	Laboratory classes: 30 Project work: 15 Lecture: 10	3	Graded assignment	Obligatory specialization courses
Environmental Quality Measurement Methods and the Monitoring of Water and Wastewater	Laboratory classes: 30 Project work: 10 Lecture: 30	4	Graded assignment	Obligatory specialization courses
English Chemical Terminology I	Tutorials: 15	1	Graded assignment	Obligatory specialization courses
Sum	360	23		

Diploma Path: Organic and Bioorganic Synthesis

Course	Number of hours	ECTS points	Form of verification	Obligatory
Methods of Organic Synthesis	Seminar: 10 Laboratory classes: 60 Lecture: 30	7	Exam	Obligatory specialization courses
Stereochemistry	Tutorials: 20 Lecture: 15	2	Graded assignment	Obligatory specialization courses
Basics of Medicinal and Combinatorial Chemistry	Seminar: 5 Laboratory classes: 15 Project work: 15 Lecture: 25	4	Exam	Obligatory specialization courses
Biocatalysis in Chemical Synthesis	Seminar: 5 Laboratory classes: 15 Lecture: 10	2	Graded assignment	Obligatory specialization courses
Methods of Separation and Identification of Organic Compounds	Laboratory classes: 60 Project work: 45 Lecture: 15	7	Graded assignment	Obligatory specialization courses
English Chemical Terminology II	Tutorials: 15	1	Graded assignment	Obligatory specialization courses
Sum	360	23		

Diploma Path: Biomedical Chemistry

Course	Number of hours	ECTS points	Form of verification	Obligatory
An Introduction to Medicinal Chemistry and Molecular Biology	Seminar: 20 Laboratory classes: 15 Lecture: 50	5	Exam	Obligatory specialization courses
Basics of Biopharmaceutics and Pharmacokinetics and Drug Design	Laboratory classes: 45 Lecture: 15	4	Graded assignment	Obligatory specialization courses
Biomaterials and Medical Nanotechnology	Laboratory classes: 30 Lecture: 30	4	Exam	Obligatory specialization courses
Chemical Foundations of Medical Diagnostics	Laboratory classes: 40 Project work: 10 Lecture: 45	6	Graded assignment	Obligatory specialization courses
Specialization Project	Project work: 45	3	Graded assignment	Obligatory specialization courses
English Chemical Terminology III	Tutorials: 15	1	Graded assignment	Obligatory specialization courses
Sum	360	23		

Diploma Path: Chemistry of Polymeric Materials

Course	Number of hours	ECTS points	Form of verification	Obligatory
Chemistry of High Molecular Compounds	Seminar: 5 Laboratory classes: 60 Lecture: 55	8	Exam	Obligatory specialization courses
Specialty Polymer Materials	Laboratory classes: 30 Project work: 15 Lecture: 15	4	Graded assignment	Obligatory specialization courses

Course	Number of hours	ECTS points	Form of verification	Obligatory
Polymer Testing Methods	Laboratory classes: 30 Project work: 10 Lecture: 50	5	Exam	Obligatory specialization courses
Technology and Processing of Polymers	Laboratory classes: 15 Lecture: 15	2	Graded assignment	Obligatory specialization courses
Specialization Project	Project work: 45	3	Graded assignment	Obligatory specialization courses
English Chemical Terminology IV	Tutorials: 15	1	Graded assignment	Obligatory specialization courses
Sum	360	23		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Internship	Internship: 0	6	Pass	Obligatory
Interdisciplinary Project	Project work: 20	2	Graded assignment	Obligatory subjects to choose from
Final Project	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Engineering Laboratory	Seminar: 10 Project work: 65	3	Graded assignment + exam	Obligatory
Elective Courses 4		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Raw Materials and Chemical Management	Project work: 20 Lecture: 10	2	Graded assignment	Optional

Course	Number of hours	ECTS points	Form of verification	Obligatory
The Company of the Future - Quality Management	Lecture: 30	2	Graded assignment	Optional
Elective Courses 3		2	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Professional Ethics and Fundamentals of Entrepreneurship with Elements of Occupational Health and Safety	Lecture: 45	2	Graded assignment	Optional
Law and Fundamentals of Entrepreneurship with Elements of Occupational Health and Safety	Lecture: 45	2	Graded assignment	Optional
Sum	170	30		