



Lodz University
of Technology

Study programme

Faculty:	Faculty of Process and Environmental Engineering
Major:	Industrial Process Engineering
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:	Industrial Process Engineering
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:	2724
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:	0711
Language of study:	polish

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

Discipline	Percentage share
Chemical engineering	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	1IPP1	Possesses a solid foundation in chemistry, physics, and mathematics necessary for the description and analysis of chemical engineering processes and thermodynamics; understands the mechanisms of momentum, heat, and mass transport and transfer in chemical engineering processes.	P6U_W	P6S_WG
2	1IPP2	Has knowledge of key chemical and process engineering processes, including: (1) momentum, heat and mass exchange mechanisms and their application in unit operations and process apparatus; (2) principles of mass, energy and momentum balancing in process engineering processes; (3) product separation, separation and purification processes; (4) fundamentals of chemical and biochemical reaction engineering.	P6U_W	P6S_WG
3	1IPP3	Has knowledge of ethical principles and professional standards applicable in chemical and process engineering, including occupational safety, protection of intellectual property, and copyright law; understands the fundamentals of entrepreneurship development and the concepts of sustainable development and their importance for the social responsibility of an engineer in industrial practice.	P6U_W, P6U_K	P6S_WK, P6S_KR
4	1IPP4	Applies analytical and critical thinking to identify, formulate, and solve complex and atypical engineering problems related to industrial processes and process installations, selecting appropriate computational, technological, and organisational methods.	P6U_U, P6U_K	P6S_UW, P6S_KK
5	1IPP5	Plans, conducts, and analyses typical experiments related to unit operations and engineering processes, verifying theoretical relationships and basic computational models; performs measurements and processes results in accordance with safety regulations and good laboratory practice.	P6U_U	P6S_UW, P6S_UO
6	1IPP6	Designs selected elements of industrial processes and proposes their improvements, analysing technical feasibility, basic economic aspects, environmental impact, and operational efficiency; applies simulation tools and computational methods to analyse and compare process variants.	P6U_U, P6U_K	P6S_UW, P6S_UO, P6S_KK
7	1IPP7	Presents various technical concepts, design proposals, and results of analyses and studies in a clear and structured manner, preparing technical reports and presentations adapted to diverse audiences — including engineering teams, stakeholders, and non-technical recipients, participating in a debate — and communicates in a foreign language at the B2 level, using basic engineering terminology.	P6U_U	P6S_UK
8	1IPP8	Generates and evaluates innovative ideas for solving engineering problems and demonstrates basic entrepreneurial competences in analysing implementation opportunities, assessing the application potential of solutions, and identifying technical and economic risks.	P6U_U, P6U_K	P6S_UW, P6S_KO

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	1IPP9	Recognises the global context of industrial activity and assesses its cultural, social, environmental, and health-related impacts, particularly in the field of chemical and process engineering; demonstrates professional responsibility and awareness of the need for systematic updating of engineering knowledge and competences in response to technological development and changing regulatory conditions.	P6U_W, P6U_U, P6U_K	P6S_WK, P6S_UU, P6S_KK, P6S_KO, P6S_KR
10	1IPP10	Works effectively in project and operational teams, demonstrating well-developed interpersonal skills and basic leadership qualities that support the achievement of common goals. Respects diverse perspectives, supports collaboration and team integration, and actively contributes to achieving high-quality team outcomes.	P6U_U	P6S_UO

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

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
1	Mathematics I	Fundamental concepts of mathematical analysis and linear algebra for engineering modelling, including functions of one and several variables and their application in technical problems.	x			x						
2	Chemistry I	Fundamental topics of general and inorganic chemistry, including the structure of matter, properties of substances, chemical reactions, and their significance in engineering processes. The course places particular emphasis on basic chemical reactions used in the technology of inorganic compound production. In addition, the course covers fundamental chemical calculations, including those based on the stoichiometry of chemical reactions.	x			x						
3	Physics	Fundamental topics in classical physics, including mechanics, basic thermodynamics, and wave phenomena, relevant to the description of engineering processes. The course provides a foundation for understanding momentum, energy, and mass transport phenomena in process engineering.	x			x						
4	Introduction to Chemical and Process Engineering	Fundamental concepts and scope of chemical and process engineering, the role of a process engineer, and the position of the discipline in chemical and related industries. The course introduces the description of technological processes, unit operations, and process equipment as a foundation for further engineering education.		x	x						x	
5	Technical Documentation	Principles of preparing and interpreting technical documentation used in process engineering, including technical drawings, process flow diagrams, and documentation of equipment and installations. The course develops skills in reading, creating, and applying documentation in the design and operation of industrial processes.							x			
6	Mechanics and Strength of Materials	Fundamentals of solid mechanics and strength of materials, including the analysis of stresses, strains, and strength criteria of structural elements. The course provides a basis for the design and safety assessment of equipment and structures used in process engineering.	x	x		x						
7	Information Technologies I	Practical use of MS Office tools for technical reports, data analysis, and engineering-oriented presentations. It also develops basic digital competencies, including algorithmic thinking and principles of secure data handling.				x		x	x			
8	Mathematics II	Extended topics in mathematical analysis and linear algebra, including differential and integral calculus of multivariable functions and elements of differential equations. The course provides mathematical tools essential for modelling and analysing engineering processes in chemical and process engineering.	x									
9	Chemistry II	Fundamental topics of organic chemistry, including the properties of organic compounds, chemical reactions of organic compounds, and their significance in engineering processes. The course also covers advanced chemical calculations based on equilibria in aqueous solutions, including pH, solubility, and calculations involving oxidation-reduction reactions.	x	x								

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
10	Statistics and Data Analysis	The course introduces the foundations of descriptive statistics, probability, and statistical inference, including estimation, hypothesis testing, analysis of variance, and regression. Laboratory classes focus on practical data analysis in Excel, covering statistical data summaries, measurement uncertainty, statistical tests, and regression analysis.				x	x					
11	Fluid Mechanics	Fundamental topics in fluid mechanics, including fluid statics and dynamics and the description of real fluid flows. The course provides a foundation for analysing momentum transport processes and designing process equipment and installations.	x	x		x						
12	CAD Design	Fundamentals of computer-aided design (CAD) in engineering, including the creation and editing of 2D and 3D models of technical components and assemblies. The course develops skills in using CAD tools for designing equipment and installations applied in process engineering.						x	x			
13	English B2 module I	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
14	English B2+ module I	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
15	English C1 module I	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
16	German B2 module I	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
17	Heat Transfer Processes and Apparatuses	Fundamentals of heat transfer processes and the construction and operation of thermal equipment used in process engineering. The course introduces the analysis and selection of heat exchangers and other thermal devices applied in industrial installations.		x				x				
18	Information Technologies II	The course develops algorithmic problem-solving skills and Python programming for more advanced engineering calculations and data analysis. It also introduces modern digital tools supporting engineering work and fundamental aspects of cybersecurity.				x		x				
19	Mechanical Processes and Apparatuses	Fundamentals of mechanical processes in process engineering, including size reduction, screening, mixing, sedimentation, and material handling. The course introduces the construction, operating principles, and selection of mechanical equipment used in industrial installations.		x				x				
20	English B2 module II	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
21	English B2+ module II	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
22	English C1 module II	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
23	German B2 module II	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
24	Critical Thinking	The course develops logical and reflective thinking skills, including the ability to formulate relevant questions and critically evaluate information and arguments. Students learn to analyze data, identify reasoning errors, and make informed decisions based on rational judgment and evidence.									x	
25	The Logical Principles of Reasoning and Communication	The course introduces fundamental concepts of logic and principles of correct reasoning and argumentation. Students develop skills in clear communication, analysis of statement structure, and identification of logical fallacies in discussions and information exchange.									x	
26	Engineering Ethics	The course introduces principles of professional ethics and engineering responsibility in the context of designing, implementing, and operating technical solutions. Students analyze ethical dilemmas related to safety, social and environmental impact, and responsible engineering decision-making.									x	
27	Ethics of New Technologies	The course focuses on ethical challenges associated with the development and implementation of modern technologies, including digitalization, automation, and artificial intelligence. Students learn to assess technological consequences in social, legal, and environmental contexts and to formulate responsible decision-making approaches.									x	
28	The human in the world of new technologies	The course examines the relationship between technological development and human functioning in the modern world. Students explore social, cultural, and psychological consequences of new technologies and learn to critically assess their impact on quality of life and social relations.									x	
29	Analytical and Instrumental Chemistry	Fundamentals of chemical analysis including classical and instrumental methods used for determining the composition and properties of substances. The course introduces the principles of selected analytical techniques and their applications in process control and material analysis.		x			x					
30	Fundamentals of Chemical Technology	Fundamentals of chemical technology, including the characteristics of raw materials, processes, and installations used in the chemical industry. The course introduces the analysis of technological process flows and the relationships between chemical reactions, unit operations, and process equipment.		x				x				
31	Physical Chemistry and Thermodynamics	Fundamentals of physical chemistry and thermodynamics, including chemical equilibrium, phase transformations, and energy balances in process systems. The course provides a foundation for the analysis and design of technological processes in chemical and process engineering.	x	x								
32	Diffusion Processes and Apparatuses	Fundamentals of diffusion and mass transfer processes in process engineering, including transport mechanisms and process balancing. The course introduces the construction, operating principles, and selection of equipment used in separation and mass transfer operations.		x				x				

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
33	Measurement and Control in Industrial Installations	Fundamentals of process measurement and control systems used in industrial installations. The course introduces principles of selecting sensors, transmitters, and automation systems supporting safe and efficient process operation.		x				x				
34	Bioprocess Engineering	Fundamentals of bioprocess engineering, including bioreactor operation, microorganism growth kinetics, and bioprocess balancing. The course introduces the design and analysis of bioprocesses used in the chemical, biotechnological, and environmental industries.		x				x				
35	English B2 module III	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
36	English B2+ module III	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
37	English C1 module III	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
38	German B2 module III	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
39	Project in Heat and Mass Transfer Processes	The course focuses on the design and analysis of heat and mass transfer processes in process engineering installations. Students carry out project tasks involving process balancing, selection of appropriate apparatus, and evaluation of operational parameters of thermal and diffusion processes. The course develops the ability to integrate theoretical knowledge with practical problem-solving in process design.				x		x				
40	Identifying and Solving Processes Problems (PBL)	Application of the Problem-Based Learning (PBL) approach to the identification, analysis, and solution of real industrial process problems. The course develops teamwork skills, critical thinking, and engineering decision-making based on process analysis.				x			x	x		x
41	Process Dynamics and Automation	Dynamic modelling of industrial processes and fundamentals of automatic process control. The course introduces stability analysis, controller selection, and performance evaluation of control systems in process engineering.										
42	Chemical Reactors Engineering	Fundamentals of chemical reactor engineering, including reaction kinetics, mass and energy balances, and the characteristics of different reactor types. The course introduces the selection and evaluation of reactors used in industrial chemical and process engineering.		x		x		x				
43	English B2 module IV	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
44	English B2+ module IV	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
45	English C1 module IV	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
46	German B2 module IV	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.							x			
47	Bioprocess Engineering in Environmental Protection	Application of bioprocesses in environmental protection, including biological methods for the treatment of water, wastewater, gases, and waste. The course introduces the analysis and design of environmental bioprocesses using microorganisms and process engineering principles.		x		x						
48	Hazards and Microbiological Safety	Identification of microbiological hazards and principles of ensuring microbiological safety in industrial and environmental processes. The course introduces methods of risk assessment, monitoring, and control of microorganisms in technological installations.		x		x						
49	Polymeric Materials and Their Processing	Fundamentals of polymer materials, including their properties, structure, and classification, as well as industrial polymer processing methods. The course introduces the analysis of polymer processing operations and the selection of technological parameters from a process engineering perspective.		x		x						
50	Mixing Liquids and Granular Materials	Fundamentals of liquid and granular material mixing, including hydrodynamic and mechanical mechanisms and the operating characteristics of mixers. The course introduces the selection of mixing equipment and process parameters in process engineering installations.		x		x						
51	Summative Module	Integration of knowledge and skills acquired during the course of studies through cross-disciplinary and problem-oriented tasks. The module provides a synthetic assessment of the student's preparedness to solve complex problems in process engineering.		x		x		x			x	
52	Quality and Environmental Management Systems	Fundamentals of quality and environmental management systems applied in industry, including standards, procedures, and process improvement tools. The course introduces the integration of quality and environmental requirements in the design, operation, and improvement of industrial processes.			x						x	
53	Fundamentals of Numerical Methods in Chemical Engineering	Practical application of numerical methods to modeling chemical engineering processes, including solving differential equations describing reactions, mass and heat transport, and system dynamics. Students learn to construct and analyze models with attention to numerical algorithms, boundary conditions, and interpretation of simulation results.	x			x						
54	Elements of Business Management	Fundamental issues related to running a business, including legal, organizational, and financial aspects of enterprises. The course introduces principles of company operations and economic decision-making in the context of engineering activities.			x					x		
55	Industrial Process Safety	Fundamentals of hazard identification, risk assessment, and accident prevention in industrial installations. The course introduces principles of process design and operation with consideration of technical, environmental, and process safety.			x						x	

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
56	Bioreactor Engineering and Bioprocess Simulation	Fundamentals of bioreactor design and analysis, as well as modelling and simulation of bioprocesses. The course introduces bioprocess kinetics, mass and energy balances, and the use of simulation tools in bioprocess engineering.		x		x						
57	Engineering of Plasma Techniques	Fundamentals of plasma generation and properties, along with their applications in chemical and process engineering. The course introduces the use of plasma techniques in material modification, functional coating synthesis, and environmental processes.		x		x						
58	Multiphase Flows	Fundamentals of multiphase flows, including gas-liquid, liquid-solid, and gas-solid systems, with an emphasis on hydrodynamic and transport phenomena. The course introduces modelling, analysis, and selection of process parameters in process engineering installations.		x		x						
59	Physical Chemistry of Dispersed Systems	Fundamentals of the chemical physics of dispersed systems, including colloids, emulsions, suspensions, and stabilization mechanisms. The course introduces the analysis of physicochemical properties and behaviour of dispersed systems in chemical and process engineering applications.		x		x						
60	Diploma Seminar	Preparation for the diploma thesis through literature analysis, formulation of the research problem, and presentation of the thesis objectives and results. The course develops skills in scientific discussion, technical argumentation, and preparation for the thesis defense.				x			x			
61	Final Project	Independent completion of a diploma thesis addressing a defined engineering problem in chemical and process engineering. The course confirms the student's ability to integrate knowledge, apply analytical and design methods, and formulate engineering-based conclusions.		x		x		x	x			
62	Internship	Completion of a professional internship in an industrial environment, enabling the application of theoretical knowledge under real engineering conditions. The course develops professional competences, teamwork skills, and an understanding of industrial enterprise operations.				x					x	x
63	Drying Processes and Equipment	Fundamentals of drying processes, including heat and mass transfer mechanisms and moisture removal kinetics. The course introduces the construction, operating principles, and selection of drying equipment used in industrial installations.		x		x			x			
64	Instrumental Methods of Quality Control	Fundamentals of instrumental quality control methods applied to the analysis of raw materials, intermediates, and finished products. The course introduces the selection and interpretation of analytical techniques used for monitoring and improving industrial processes.		x		x			x			
65	Separations Processes	Fundamentals of separation processes used in chemical and process engineering, including equilibrium and rate-based mechanisms as well as mass and energy balances. The course introduces the analysis, selection, and design of separation equipment applied in industrial installations.		x		x			x			

No.	Course name	Program content	1IPP1	1IPP2	1IPP3	1IPP4	1IPP5	1IPP6	1IPP7	1IPP8	1IPP9	1IPP10
66	Case Studies of Industrial Process Engineering	Analysis and evaluation of industrial processes using mass and energy balances, performance indicators, and analytical methods. The course develops skills in identifying opportunities for process optimisation and improvement in process engineering.				x		x				
67	Engineering Competency Development	The subject is designed to reinforce and complement the key engineering competencies identified from the previous semester's summative module assessment. It focuses on consolidating the knowledge and skills necessary for effective problem solving in industrial process engineering.		x		x		x				

ECTS - subjects

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
1	Mathematics I	8				
2	Chemistry I	5			5	
3	Physics	6				
4	Introduction to Chemical and Process Engineering	2				
5	Technical Documentation	3				
6	Mechanics and Strength of Materials	4				
7	Information Technologies I	2				
8	Mathematics II	6				
9	Chemistry II	5			5	
10	Statistics and Data Analysis	3				
11	Fluid Mechanics	8			8	
12	CAD Design	6				
13	English B2 module I	2		2		
14	English B2+ module I	2		2		
15	English C1 module I	2		2		
16	German B2 module I	2		2		
17	Heat Transfer Processes and Apparatuses	5			5	
18	Information Technologies II	3			3	
19	Mechanical Processes and Apparatuses	6			6	
20	English B2 module II	2		2		
21	English B2+ module II	2		2		

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
22	English C1 module II	2		2		
23	German B2 module II	2		2		
24	Critical Thinking	2	2	2		
25	The Logical Principles of Reasoning and Communication	2	2	2		
26	Engineering Ethics	3	3	3		
27	Ethics of New Technologies	3	3	3		
28	The human in the world of new technologies	3	3	3		
29	Analytical and Instrumental Chemistry	6			6	
30	Fundamentals of Chemical Technology	3				
31	Physical Chemistry and Thermodynamics	11			11	
32	Diffusion Processes and Apparatuses	5			5	
33	Measurement and Control in Industrial Installations	7			7	
34	Bioprocess Engineering	5			5	
35	English B2 module III	2		2		
36	English B2+ module III	2		2		
37	English C1 module III	2		2		
38	German B2 module III	2		2		
39	Project in Heat and Mass Transfer Processes	6			6	
40	Identifying and Solving Processes Problems (PBL)	4		4	4	
41	Process Dynamics and Automation	5			5	
42	Chemical Reactors Engineering	4			4	
43	English B2 module IV	3		3		

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
44	English B2+ module IV	3		3		
45	English C1 module IV	3		3		
46	German B2 module IV	3		3		
47	Bioprocess Engineering in Environmental Protection	4		4	4	
48	Hazards and Microbiological Safety	4		4	4	
49	Polymeric Materials and Their Processing	4		4	4	
50	Mixing Liquids and Granular Materials	4		4	4	
51	Summative Module	8		8	8	
52	Quality and Environmental Management Systems	5				
53	Fundamentals of Numerical Methods in Chemical Engineering	2		2	2	
54	Elements of Business Management	4			4	
55	Industrial Process Safety	3				
56	Bioreactor Engineering and Bioprocess Simulation	4		4	4	
57	Engineering of Plasma Techniques	4		4	4	
58	Multiphase Flows	4		4	4	
59	Physical Chemistry of Dispersed Systems	4		4	4	
60	Diploma Seminar	2			2	
61	Final Project	15		15	15	
62	Internship	6				
63	Drying Processes and Equipment	3		3	3	3
64	Instrumental Methods of Quality Control	3		3	3	3
65	Separations Processes	3		3	3	3

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
66	Case Studies of Industrial Process Engineering	2			2	
67	Engineering Competency Development	2		2	2	

ECTS indicators

Name	Value
The total number of ECTS credits that a student must obtain through elective courses (amounting to no less than 30% of the total ECTS credits required to obtain the qualification corresponding to the given level of study)	64/210 (30.48%)
The total number of ECTS credits to be earned by a student through courses in the fields of humanities or social sciences	5
The total number of ECTS credits that a student must obtain from courses related to research conducted at the university, amounting to more than 50% of the total ECTS credits required to graduate from a given level of study	139/210 (66.19%)

Methods of verifying and assessing learning outcomes

The course description includes descriptions of learning outcomes and their references to program-specific learning outcomes. Course objectives may be partially or completely identical to program-specific learning outcomes. The course description also includes methods of verifying the achieved learning outcomes. Verification of students' acquired competences requires the use of various forms of assessment that are adequate to the intended learning outcomes. The choice of appropriate tools depends on the characteristics of the subject and the methodology of teaching and is described in detail in the individual subject cards. Verification of acquired competences is carried out through:

- a) written work (exams, tests, reports, theses, etc.),
- b) oral presentations (oral tests, public speeches, e.g., giving a paper or presentation),
- c) practical tasks and/or projects (individual and group),
- d) observations and assessments of student activity during classes,
- e) self-assessment and peer assessment, especially in the case of group projects,
- f) competency exams and diploma exams.

Professional internships

Six weeks of professional internship completed after the sixth semester, worth 6 ECTS credits.

The internship is technological or specialized in nature. The aim of the internship is for the student to demonstrate their knowledge of the practical application of the knowledge and skills acquired at the first-cycle level. The internship program must be consistent with the Framework Internship Program for Industrial Process Engineering. The student undertakes the internship on the basis of a written agreement concluded by a representative of the University with the company accepting the student for the internship, chosen by the student. The choice of the company and the date of the internship is made by the student in consultation with the company, after prior approval by the Dean. The student completes a minimum of 6 weeks of internship. Completion of the internship depends on the form of the internship:

1. Referral from the University - completed internship report and certificate of completion issued by the company
2. Internship - completed internship report and certificate of completion issued by the company
3. Professional work or own business activity - application to the Dean and certificate of employment or extract from the register.

Characteristics of the course

Graduate profile

Industrial Process Engineering is a field of study for people who want to understand and contribute to modern industry. It is based on the four pillars of contemporary process engineering: fluid flow, heat transfer, mass transport, and chemical and biochemical reaction engineering. These phenomena are the foundation of modern industrial installations – from the production of medicines and food, through energy technologies, to advanced chemical and biotechnological processes.

During your studies, you will gain the knowledge to analyze and design technological processes using modern computational and simulation tools. You will learn to model liquid and gas flows, optimize heat exchange, design chemical and biochemical reactors, and evaluate the energy efficiency of installations. You will also learn the basics of process automation, data analysis, and numerical methods, which are now an integral part of the digital transformation of industry.

Graduates of this program are able to combine technical knowledge with the ability to solve engineering problems in a practical way. They understand the principles of process safety, the impact of industrial activity on the environment, and the importance of sustainable development in the design of modern technologies. They are prepared to work in a dynamic industrial environment—in the chemical, pharmaceutical, food, energy, or biotechnology sectors—in the areas of production, design, and process optimization.

These studies open the way to work with modern, technologically advanced installations and to further development in master's studies, where it is possible to deepen one's competence in the field of process engineering, simulation, process intensification, and future technologies.

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

On December 18, 2019, the Senate of the Lodz University of Technology adopted Resolution No. 132/2019 describing the development strategy of the Lodz University of Technology for 2020-2025. It defines the SAIL concept, which is an acronym for the English words and, at the same time, the adopted priorities for the university's development, so that it becomes one of the best scientific and research units in Poland and recognizable in Europe and worldwide. The success of this strategy is reflected in the steadily growing international standing of the Lodz University of Technology. Briefly explained, the "S" priority is the development of science, staff, and students. The priority of "A" is the development of university management by developing its awareness, agility, and accountability. The priority of "I" is to build a strong position for the university by increasing internationalization, innovativeness, and the development of modern infrastructure. Priority "L" is to ensure a high level of education (Learning), strengthen cooperation with the environment (Linkage) and strong leadership (Leadership).

Several objectives have been set for each of the priorities. The presented study program in the field of Industrial Process Engineering is closely related to the following objectives:

Objective 1.1.1. Obtaining the highest categories and scientific qualifications in the disciplines in which the University conducts research.

Chemical Engineering, a discipline assigned to the field of Industrial Process Engineering, was awarded the scientific category A+ during the last evaluation, which proves the high quality of research conducted by scientists conducting research and publishing in this scientific discipline. The vast majority of these scientists are employees of the Faculty of Process Engineering and Environmental Protection. In order for the discipline to continue to develop at its current pace, it is necessary to continuously recruit new researchers. The Industrial Process Engineering study program is based on the experience and knowledge of the best specialists from the Faculty of Process Engineering and Environmental Protection, which bodes well for the education of future generations.

Objective 1.1.3. Development of a strong Doctoral School

The development of the Doctoral School cannot take place without the participation of doctoral students. An attractive Industrial Process Engineering study program at the S1 and S2 levels, based on the needs of modern chemical engineering, will increase interest in these studies.

As a result, graduates are more likely to be interested in pursuing doctoral studies, which will contribute to the development of the Doctoral School.

Objective 1.3.3. Individualized approach to students

The study program includes a large number of classes that require students to work independently in consultation with the faculty. Thanks to this approach, students have a real opportunity to develop the skills they themselves consider important. The studies thus take on an individual character, and students have an influence on their own education. A wide range of elective courses also allows for the individual educational needs of each student to be met.

All objectives in the Innovativeness priority (marked as 3.2. in the resolution):

Objective 3.2.1 Stimulating research and innovative activities in connection with the economic and social environment

Objective 3.2.2. Active participation of the University in the creation of a regional innovation system

Objective 3.2.3. Supporting creative and innovative attitudes among the academic community

The Industrial Process Engineering study program is based on market demand and was developed in cooperation with the economic environment. It was consulted with representatives of companies from the Łódź Province and neighboring provinces.

For obvious reasons, the Industrial Process Engineering study program best fits the objectives of the Learning priority (marked as 4.1. in the resolution). Three key objectives have been set within this priority:

Objective 4.1.1. Modern methods, innovative programs, and flexible education paths

Objective 4.1.2. Integration of education and science

Objective 4.1.3. Promotion of lifelong learning.

The Industrial Process Engineering study program has been designed based on a contemporary approach to chemical and process engineering, with an emphasis on the practical preparation of engineers for work in an industrial environment. The program uses modern teaching methods, such as problem-based learning (PBL), case teaching, and elements of design thinking, which support active learning and the development of engineering skills.

During their studies, students learn to independently obtain and analyze technical literature, including in English, with the support of academic and teaching staff. This approach promotes the development of skills in systematically supplementing knowledge and integrating the education process with academic experience and engineering practice.

The core of the program consists of courses covering unit operations and basic process mechanisms characteristic of chemical and process engineering, in particular: fluid mechanics, mechanical processes and apparatus, thermal processes and apparatus, diffusion processes and apparatus, and physical chemistry and thermodynamics. These subjects provide students with a solid foundation for the analysis and design of industrial processes. The program is supplemented with topics in bioprocess engineering and chemical and biochemical reactor design, responding to the current needs of industry.

The entire program is geared towards the needs of the economy and the competencies expected of engineering graduates, while drawing on the knowledge and experience of the staff of the Faculty of Process Engineering and Environmental Protection at the Lodz University of Technology. Graduates are prepared to take up employment in industrial plants using chemical and process engineering solutions and to continue their education at the second-cycle level.

Educational objectives and employment and continuing education opportunities

The aim of the first-cycle program in Industrial Process Engineering is to provide students with a solid theoretical and practical foundation in chemical and process engineering, taking into account contemporary and innovative solutions used in industry. The program aims to prepare students to analyze, design, and operate basic industrial processes using computational and design tools and elements of experimental analysis.

During their studies, students acquire the ability to solve typical engineering problems, assess the suitability of technical methods and tools, and use specialist literature and databases, including those in English. The curriculum develops the skills necessary for teamwork, technical communication, and the application of safety, quality, and environmental protection principles in engineering.

Graduates of this program are prepared to work in the chemical, pharmaceutical, cosmetics, and food industries, as well as in design offices, maintenance departments, process control, and technical and development teams of industrial enterprises. The professional experience of previous graduates of the Faculty of Process Engineering and Environmental Protection at the Lodz University of Technology confirms the possibility of employment also in sectors related to energy, engineering materials, and technical consulting.

Graduates have basic knowledge of process economics and business activities, enabling them to make a preliminary assessment of the technical and economic efficiency of engineering solutions. They are aware of the need for systematic improvement of their professional competences and are prepared to continue their education at the second-cycle level in the field of chemical and process engineering.

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

The proposed Industrial Process Engineering program includes content related to the previously implemented Chemical and Biochemical Engineering program, and also addresses new challenges, particularly those facing industry and the region. The program has been modernized by reducing the number of courses in favor of larger, thematically coherent blocks. The smaller number of subjects will allow for a closer link between the verification methods adopted by the implementers of the blocks and the learning outcomes of the program. The new study program was adopted in 2024 and resulted in good enrollment during the 2024 and 2025 recruitment periods. This documentation presents the revised program in accordance with the requirements described in Resolution No. 24/2025 of the Senate of the Lodz University of Technology of February 26, 2025, on guidelines for Study Program Councils regarding the creation and improvement of study program designs. Cosmetic changes resulting from the aforementioned guidelines have been introduced, and the observations and opinions of students and lecturers have been taken into account. The most important changes in the Industrial Process Engineering S1 program are:

Separation of topics related to statistics and data processing from the Information Technology II lecture and creation of a new course under this name in semester 2. The new course allows students to prepare for working with experimental data in subject laboratories.

The creation of a course in semester 6: "Fundamentals of the application of numerical methods in chemical engineering," which aims to introduce modern methods of engineering calculations using simulation computer programs.

Moving the course "Analytical and Instrumental Chemistry" to semester 3 and the course "Physical Chemistry and Thermodynamics" to semester 4. The need for this change stems from the need for students to first learn the analytical methods used in the later physical chemistry laboratory.

Creation of the course "Improvement of Engineering Competences" in semester 7, which aims to fill the gaps in knowledge identified during the implementation of the "Sumative Module."

On December 5, 2025, a meeting of the WIPOŚ PL Business Council was held at the Faculty of Process Engineering and Environmental Protection of the Lodz University of Technology. The Business Council is a social advisory body supporting the Faculty authorities in developing strategies for scientific and teaching activities. It is composed of representatives of government, local and special administration, as well as companies from the Łódź region cooperating with the Faculty.

The purpose of the meeting was to seek the opinion of the socio-economic environment on the competences and skills expected by employers from the Faculty's graduates, as well as to exchange experiences between the business world and the academic community. The information obtained was to be used to adapt the forms and scope of education to the requirements of the modern, competitive labor market. In addition, steps were taken to establish Business Councils for individual fields of study.

The meeting was attended by representatives of the following companies and organizations:

Orifarm Manufacturing,

Multiwir,

Equipo Europe P.S.A.,

PGE GIEK S.A.,

STO Sp. z o.o.,

the National Association of Occupational Health and Safety Employees,

RENA-POL Sp. z o.o.,

Chemat Sp. z o.o.,

Veolia Energy Contracting Poland,

and Hitachi Astemo Poland.

During the meeting, the Dean of the Faculty presented the fields of study offered at WIPOŚ PŁ and proposed areas for further cooperation between the Faculty and the Business Council, with particular emphasis on teaching issues. Representatives of the socio-economic environment were asked to complete a survey on the key competencies of graduates, desired areas of expertise, and types of professional roles from the perspective of the organizations they represent. The survey also included questions about preferred forms of cooperation with the Faculty and interest in membership in Business Councils for individual fields of study.

Based on the survey results, a Business Council was established for the Industrial Process Engineering major, composed of:

Łukasz Dawidowicz – Orifarm Manufacturing,

Joanna Kwaśniak – Multiwir,

Barbara Łukasiewicz – Equipo Europe P.S.A.,

Anna Stach-Stawińska – PGE GIEK S.A.

In the opinion of business representatives, the most important competencies of graduates are responsibility and professional ethics, as well as broadly understood soft skills, in particular critical and analytical thinking. At the same time, the importance of a solid theoretical foundation as a prerequisite for understanding production and business processes was emphasized. Company representatives expressed interest in developing cooperation, primarily in the area of student internships and work placements, joint thesis projects, and the participation of practitioners in teaching as experts.

In response to the expectations of the Business Council members, humanities subjects such as Critical Thinking, Logical Foundations of Thinking and Communication, Engineering Ethics, and Ethics of New Technologies were introduced into the elective block of the new Industrial Process Engineering study program to strengthen the development of graduates' social and ethical competencies.

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

In accordance with the applicable admission resolution for the given academic year.

The unit organizing education

Faculty of Process and Environmental Engineering

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mathematics I	Tutorials: 90 Lecture: 30	8	Exam	Obligatory
Chemistry I	Tutorials: 30 Lecture: 30	5	Graded assignment	Obligatory
Physics	Tutorials: 30 Laboratory classes: 15 Lecture: 45	6	Exam	Obligatory
Introduction to Chemical and Process Engineering	Seminar: 10 Lecture: 20	2	Graded assignment	Obligatory
Technical Documentation	Project work: 45	3	Graded assignment	Obligatory
Mechanics and Strength of Materials	Tutorials: 30 Project work: 15 Lecture: 15	4	Graded assignment	Obligatory
Information Technologies I	Laboratory classes: 30	2	Graded assignment	Obligatory
Sum	435	30		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Mathematics II	Tutorials: 60 Lecture: 30	6	Exam	Obligatory
Chemistry II	Tutorials: 30 Lecture: 30	5	Exam	Obligatory

Course	Number of hours	ECTS points	Form of verification	Obligatory
Statistics and Data Analysis	Laboratory classes: 25 E-learning: 15	3	Graded assignment	Obligatory
Fluid Mechanics	Tutorials: 30 Laboratory classes: 30 Project work: 15 Lecture: 30	8	Exam	Obligatory
CAD Design	Laboratory classes: 45 Project work: 30	6	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
Sum	430	30		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Heat Transfer Processes and Apparatuses	Tutorials: 30 Lecture: 30	5	Exam	Obligatory
Information Technologies II	Laboratory classes: 30 E-learning: 15	3	Graded assignment	Obligatory
Mechanical Processes and Apparatuses	Laboratory classes: 30 Project work: 15 Lecture: 30	6	Graded assignment	Obligatory

Course	Number of hours	ECTS points	Form of verification	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
Elective Course 1		5	Graded assignment	Obligatory group
The student chooses 2 courses from the group: one worth 2 ECTS credits and the other worth 3 ECTS credits.				
Critical Thinking	Tutorials: 15 Lecture: 15	2	Graded assignment	Optional
The Logical Principles of Reasoning and Communication	Tutorials: 15 Lecture: 15	2	Graded assignment	Optional
Engineering Ethics	Tutorials: 30	3	Graded assignment	Optional
Ethics of New Technologies	Project work: 30	3	Graded assignment	Optional
The human in the world of new technologies	Tutorials: 30	3	Graded assignment	Optional
Analytical and Instrumental Chemistry	Laboratory classes: 45 Lecture: 30	6	Exam	Obligatory
Fundamentals of Chemical Technology	Seminar: 15 Lecture: 30	3	Graded assignment	Obligatory
Sum	420	30		

Semester 4

Course	Number of hours	ECTS points	Form of verification	Obligatory
Physical Chemistry and Thermodynamics	Tutorials: 45 Laboratory classes: 45 Lecture: 50	11	Exam	Obligatory
Diffusion Processes and Apparatuses	Tutorials: 35 Lecture: 30	5	Exam	Obligatory
Measurement and Control in Industrial Installations	Laboratory classes: 20 Project work: 20 Lecture: 50	7	Graded assignment	Obligatory
Bioprocess Engineering	Laboratory classes: 30 Lecture: 30	5	Graded assignment	Obligatory
Foreign Language Module 3		2	Graded assignment	Obligatory group
The student chooses one module from the group.				
English B2 module III	Tutorials: 30	2	Graded assignment	Optional
English B2+ module III	Tutorials: 30	2	Graded assignment	Optional
English C1 module III	Tutorials: 30	2	Graded assignment	Optional
German B2 module III	Tutorials: 30	2	Graded assignment	Optional
Physical Education 3	Tutorials: 30	0	Pass	Obligatory
Sum	415	30		

Semester 5

Course	Number of hours	ECTS points	Form of verification	Obligatory
Project in Heat and Mass Transfer Processes	Laboratory classes: 45 Project work: 40	6	Graded assignment	Obligatory
Identifying and Solving Processes Problems (PBL)	Project work: 60	4	Graded assignment	Obligatory subjects to choose from

Course	Number of hours	ECTS points	Form of verification	Obligatory
Process Dynamics and Automation	Laboratory classes: 20 Project work: 20 Lecture: 30	5	Exam	Obligatory
Chemical Reactors Engineering	Tutorials: 25 Project work: 15 Lecture: 25	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 Block 2		8	Graded assignment	Obligatory group
The student chooses 2 courses from the group.				
Bioprocess Engineering in Environmental Protection	Seminar: 10 Laboratory classes: 30 Lecture: 20	4	Graded assignment	Optional
Hazards and Microbiological Safety	Seminar: 10 Laboratory classes: 20 Project work: 10 Lecture: 20	4	Graded assignment	Optional
Polymeric Materials and Their Processing	Tutorials: 15 Laboratory classes: 15 Lecture: 30	4	Graded assignment	Optional
Mixing Liquids and Granular Materials	Laboratory classes: 40 Lecture: 20	4	Graded assignment	Optional
Sum	430	30		

Semester 6

Course	Number of hours	ECTS points	Form of verification	Obligatory
Summative Module	Project work: 110	8	Graded assignment	Obligatory subjects to choose from
Quality and Environmental Management Systems	Seminar: 15 Project work: 20 Lecture: 30	5	Exam	Obligatory
Fundamentals of Numerical Methods in Chemical Engineering	Project work: 24	2	Graded assignment	Obligatory subjects to choose from
Elements of Business Management	Project work: 30 Lecture: 30	4	Graded assignment	Obligatory
Industrial Process Safety	Seminar: 15 Project work: 15 Lecture: 15	3	Graded assignment	Obligatory
Elective Block 3		8	Graded assignment	Obligatory group
The student chooses 2 courses from the group.				
Bioreactor Engineering and Bioprocess Simulation	Laboratory classes: 30 Lecture: 30	4	Graded assignment	Optional
Engineering of Plasma Techniques	Seminar: 10 Laboratory classes: 30 Lecture: 20	4	Graded assignment	Optional
Multiphase Flows	Seminar: 15 Laboratory classes: 20 Lecture: 25	4	Graded assignment	Optional
Physical Chemistry of Dispersed Systems	Seminar: 15 Laboratory classes: 20 Lecture: 25	4	Graded assignment	Optional
Sum	424	30		

Semester 7

Course	Number of hours	ECTS points	Form of verification	Obligatory
Diploma Seminar	Seminar: 30	2	Graded assignment + exam	Obligatory
Final Project	Diploma Thesis: 0	15	Pass	Obligatory subjects to choose from
Internship	Internship: 0	6	Pass	Obligatory
Elective Block 4		3	Graded assignment	Obligatory group
The student chooses 1 course from the group.				
Drying Processes and Equipment	Laboratory classes: 15 Lecture: 30	3	Graded assignment	Optional
Instrumental Methods of Quality Control	Seminar: 10 Laboratory classes: 20 Lecture: 15	3	Graded assignment	Optional
Separations Processes	Laboratory classes: 15 Project work: 10 Lecture: 20	3	Graded assignment	Optional
Case Studies of Industrial Process Engineering	Seminar: 15 Project work: 30	2	Graded assignment	Obligatory
Engineering Competency Development	Project work: 30	2	Graded assignment	Obligatory subjects to choose from
Sum	150	30		