Lodz University of Technology

Study programme

Faculty:	Faculty of Process and Environmental Engineering
Major:	Industrial Process Engineering (in English)
Level of study:	second-cycle programme (magister 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 (in English)
Level of study:	second-cycle programme (magister inżynier)
Study profile:	general academic
Form of studies:	full-time studies
Duration of studies (number of semesters):	3
The number of ECTS points required to complete studies:	90
Total number of hours of classes:	1175
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:	47
Professional title awarded to graduates:	
ISCED code:	0711
Language of study:	English

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	**2IPP1**	Explains, interprets and analyses complex issues in chemical and biochemical engineering in an advanced manner; characterises advanced methods, techniques, and tools used for performing mass and energy balance calculations of process equipment.	P7U_W	P7S_WG
2	**2IPP2**	Possesses advanced, including specialised, knowledge in material and energy balances, fluid mechanics, momentum transfer, heat and mass transfer, reaction kinetics, separation processes, process dynamics and control, equipment design, and product manufacturing technologies; analyses and evaluates the main development trends in chemical and biochemical engineering.	P7U_W	P7S_WG
3	**2IPP3**	Recognises the ethical and professional responsibilities of an engineer in the design, operation, and improvement of industrial processes; evaluates global, cultural, social, environmental, and economic factors influencing the execution of engineering tasks and the development of entrepreneurship in the chemical and biochemical industries, taking into account the principles of sustainable development.	P7U_W, P7U_K	P7S_WK, P7S_KO
4	**2IPP4**	Formulates and tests research tasks related to modelling and design; integrates knowledge from various areas of chemical engineering and allied disciplines; performs critical analysis and evaluation of results.	P7U_U, P7U_K	P7S_UW, P7S_KK
5	**2IPP5**	Uses and adapts computer software, methods, and mathematical models for the analysis, simulation, and design of processes, equipment, and industrial installations.	P7U_U	P7S_UW
6	**2IPP6**	Designs innovative solutions to complex and non-standard engineering problems in the field of industrial process engineering, applying a systems approach and taking into account the life cycle of process equipment and installations, mass and energy balances, economic aspects, and the principles of sustainable development.	P7U_U	P7S_UW
7	**2IPP7**	Searches for, selects, and interprets information from specialised literature, databases, catalogues, and technical documentation in the field of industrial processes, process equipment, and technological parameters, in compliance with intellectual property protection principles.	P7U_U	P7S_UW
8	**2IPP8**	Communicates effectively with diverse audiences; engages in professional discussions on achievements and challenges related to the design, operation, and optimisation of industrial processes in chemical and biochemical engineering; uses a foreign language at the B2+ level and applies specialist terminology related to process engineering.	P7U_U, P7U_K	P7S_UK, P7S_KK

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	**2IPP9**	Leads a team in the field of process engineering and the chemical industry, assumes responsibility for decisions and for the role of a leader; builds an environment based on cooperation, integration, and mutual respect; plans tasks, sets and achieves goals, including those related to personal development and team learning as a future process engineer.	P7U_U, P7U_K	P7S_UO, P7S_UU, P7S_KR
10	**2IPP10**	Appreciates the professional role of an engineer in the field of chemical and process engineering; develops professional achievements and competences and makes responsible technical decisions; adheres to and promotes the principles of professional ethics; analyses the social, environmental, and economic impacts of engineering activities in the chemical and related industries.	P7U_K	P7S_KO, P7S_KR

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

No.	Course name	Program content	2IPP1	2IPP2	2IPP3	2IPP4	2IPP5	2IPP6	2IPP7	2IPP8	2IPP9	2IPP10
1	Advanced Simulation Techniques in Process Engineering	Numerical and simulation methods in process design, numerical analysis and equipment optimisation, computational fluid dynamics (CFD), process flow simulation, application of machine learning.	x			x	x					
2	Sustainable Development in Industry	Social responsibility in engineering and industry, LCA, ESG reporting and stakeholder communication, creation of economic, social, and environmental value, transparency and ethics in technical activities, sustainable development and minimisation of environmental impacts in industrial processes.			x							x
3	Operations in Bioprocess Engineering	Microbial cultivation for secondary metabolite production, simulation of bioreactor processes, bioreactors with immobilised biomass, application of bioprocesses in environmental protection.		x		x						
4	Course of European Consortium of Innovative Universities	Participation in micro-modules offered by the European Consortium of Innovative Universities (ECIU), covering topics such as resilient communities, entrepreneurship and innovation, critical thinking, interpersonal and intrapersonal skills, global citizenship, and media and information literacy. The student completes selected micro-modules with a total value of 5 ECTS.			x							x
5	Production Systems in Process Engineering	Management and optimisation of production processes, Statistical Process Control (SPC), analysis of critical parameters, planning and improvement of technological processes, protection and use of know-how, quality and production efficiency management.			x		x					x
6	Application of Nanostructured Materials in Chemical Engineering	Application of nanostructured materials in chemical and biochemical engineering, particularly in catalysis, separation processes, and environmental protection.		x		x						
7	Foreign Language - Scientific Skills	Grammatical and linguistic range adequate for writing scientific texts in the relevant field. Preparation and delivery of presentations. Case study. Review article.										
8	Mechanisms of Momentum, Heat and Mass Transfer	Advanced topics in fluid mechanics and heat and mass transfer, including extended models of momentum, energy, and mass transport. The course introduces in-depth methods for the analysis and calculation of industrial processes.										
9	Process Optimization and Intensification	Advanced concepts and techniques in chemical and biochemical engineering, optimisation and intensification of industrial processes, design and analysis of catalytic, photocatalytic, and biocatalytic processes, technologies under supercritical conditions.										
10	Heterophasic Reactors	Design and analysis of heterogeneous reactors, classification and operating principles, gas–liquid and gas–solid reactors, kinetics and balances in multiphase processes, reactor design and performance assessment in modern industrial technologies.		x		x						

No.	Course name	Program content	2IPP1	2IPP2	2IPP3	2IPP4	2IPP5	2IPP6	2IPP7	2IPP8	2IPP9	2IPP10
11	Pharmaceutical and Cosmetological Process Engineering	Industrial processes in pharmacy and cosmetology, multiphase systems (suspensions, colloids, emulsions), industrial technologies and equipment, principles of cleanliness and microbiological safety, product packaging and quality systems (GMP, GCP, GLP).		x		x						
12	Design of Industrial Processes	Methodology of industrial plant design, process scaling, production automation, preparation of technical documentation for process projects.					x	x			x	x
13	Food Industry Process Engineering	Integration of key unit operations in food processing and their impact on the properties of raw materials and products. Design and analysis of technological processing lines with particular emphasis on equipment selection, process parameters, and the rheology of food systems.		x		x						
14	Identifying and Solving Complex Rechnological Problems (PBL)	Identification and troubleshooting of issues in technological lines, application of PBL methods in teamwork, preparation for roles in project and research teams.										
15	Advanced Separation Techniques	Separation processes in chemical and process engineering, theoretical and rate-based models, vapour–liquid separation, adsorption, ion exchange, mechanical separations, supercritical extraction, membrane processes, mass and energy balances, industrial applications.		x		x						
16	Experiment Planning Methodology	Experimental design and implementation in chemical and process engineering, formulation of research objectives and variables, statistical methods and optimal experiment planning, data analysis and interpretation, research project using data analysis tools.										
17	Innovations in Chemical and Biochemical Engineering	Current research trends and emerging areas in modern chemical engineering.		x					x	x		
18	Internship	Acquisition of practical knowledge and new professional competencies in a real workplace environment.						x		x		x
19	Diploma Seminar	Acquisition of information from the literature on selected topics, its critical evaluation, and assessment of its applicability to one’s own research. Conducting discussions and presenting research results. As part of the course, a competency examination is conducted.	x	x		x				x		
20	Diploma Thesis	Implementation of an appropriate research methodology: literature review and formulation of hypotheses or specific research objectives. Identification of detailed research tasks. Selection of methods and tools adequate for solving the research problem; in the case of experimental studies – conducting experiments. Analysis of the obtained results. Description and presentation of the research outcomes. The detailed content depends on the selected research topic.		x		x	x		x			

ECTS - subjects

No.	Course name	ECTS	Subjects in the field of humanities and social sciences	Elective subjects	Profile items	Classes in a foreign language
1	Advanced Simulation Techniques in Process Engineering	9			9	9
2	Sustainable Development in Industry	5	5	5		5
3	Operations in Bioprocess Engineering	6		6	6	6
4	Course of European Consortium of Innovative Universities	5	5	5		5
5	Production Systems in Process Engineering	8			8	8
6	Application of Nanostructured Materials in Chemical Engineering	6		6	6	6
7	Foreign Language - Scientific Skills	2		2		2
8	Mechanisms of Momentum, Heat and Mass Transfer	6		6	6	6
9	Process Optimization and Intensification	7			7	7
10	Heterophasic Reactors	5		5	5	5
11	Pharmaceutical and Cosmetological Process Engineering	5		5	5	5
12	Design of Industrial Processes	8			8	8
13	Food Industry Process Engineering	5		5	5	5
14	Identifying and Solving Complex Rechnological Problems (PBL)	6		6	6	6
15	Advanced Separation Techniques	5		5	5	5
16	Experiment Planning Methodology	4			4	4
17	Innovations in Chemical and Biochemical Engineering	4			4	4
18	Internship	4				4
19	Diploma Seminar	2				2
20	Diploma Thesis	20		20	20	20

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)	44/90 (48.89%)
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	77/90 (85.56%)

Methods of verifying and assessing learning outcomes

Verification of the achieved learning outcomes requires the application 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 depends on the specifics of the course and the form of instruction, and is specified in the syllabi of individual courses.

The achievement of the required learning outcomes is verified through:

1. written assignments (exams, quizzes, reports, essays, projects, posters, thesis, etc.);
2. oral responses (oral knowledge tests, public speaking assignments such as delivering a paper, presentation, etc.);
3. practical and/or project-based tasks (team-based or individual);
4. observation and assessment of student activity during classes;
5. self-assessment and peer assessment (especially in the case of group projects);
6. a competency exam and a diploma examination.

Verification may be formative (conducted partially and repeatedly during the course) and/or summative (final assessment). The final result of the verification is expressed using the currently applicable grading scale.

The course coordinator or instructor is obliged, during the first class, to discuss the course syllabus and to define and formally communicate to students the methods of verification and the conditions under which learning outcomes will be assessed.

Professional internships

Four weeks of professional internship completed after the second semester, worth 4 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 second-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 4 weeks of internship. The completion of the internship depends on the form of the internship: Referral from the University - completed internship report and certificate of completion issued by the company.

Characteristics of the course

Graduate profile

Graduates of Industrial Process Engineering possess advanced knowledge and skills related to the design, analysis, and improvement of industrial processes in the field of chemical and process engineering. They are able to assess the usefulness of various methods, techniques, and tools for solving engineering challenges, including research tasks. They use specialized software and databases to develop innovative solutions to unusual and complex problems. They are able to communicate freely during substantive discussions, lead a team, and conduct debates on engineering topics, including in English. They understand the importance of continuous self-education and are able to learn and develop their skills after graduation.

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

On June 26, 2024, the Senate of the Lodz University of Technology adopted Resolution No. 39/2024 describing the development strategy of the Lodz University of Technology for 2025-2030, in which cooperation is the leitmotif. Studies in the field of Industrial Process Engineering fit perfectly into this theme. The TLU strategy defines activities in the following areas: impact on the socio-economic environment, internationalization, innovation and technology transfer, leadership, science, infrastructure, staff, talents, sustainability, education, and students. Most of these areas are reflected in the study program.

In the area of socio-economic impact, the study program is consistent with the idea of lifelong learning, taking into account the needs of young people and the socio-economic environment.

Referring to the second area, i.e., internationalization, the study program includes the course “Innovations in chemical and biochemical engineering” taught in English. This course focuses on discussing the latest achievements in global science, thus broadening the horizons of students. The same course fits into the next area, i.e., innovation and technology transfer. It is worth mentioning that another course, “Advanced Simulation Techniques in Process Engineering,” touches on a modern approach to process engineering, i.e., computer simulation of processes.

The area of sustainability is covered in the course “Sustainable Development in Industry,” where all knowledge focuses on an ecological, zero-emission approach to modern chemical and process engineering.

In the areas of education and students, the study program is primarily consistent in that it was developed in cooperation with the socio-economic environment. As a result, the profile of graduates meets the needs of the labor market.

In summary, the Industrial Process Engineering study program is geared towards the needs of the economy, while drawing on the knowledge and experience of scientists from the Faculty of Process Engineering and Environmental Protection. Graduates will be prepared to work in plants where chemical and process engineering is used, and will also be able to continue their education in third-cycle studies.

Educational objectives and employment and continuing education opportunities

The aim of the second-cycle studies in Industrial Process Engineering is to provide students with in-depth knowledge in areas related to chemical engineering and its innovative aspects. The main task of these studies is to equip students with specialist skills that enable them to independently solve complex problems related to design, technology, and operation, using modern tools for theoretical and experimental analysis.

Graduates will be prepared to work in industry, in design and construction offices, and in research and development teams in industries related to the chemical, pharmaceutical, cosmetics, and food industries. An analysis of the careers of previous graduates of the Faculty of Process Engineering and Environmental Protection at the Lodz University of Technology has shown that they also find employment in industries related to energy, materials, process control, and engineering consulting. They are also prepared to continue their education at the Interdisciplinary Doctoral School in the field of Chemical Engineering.

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

The second-cycle study programme in Industrial Process Engineering was developed on the basis of consultations with both internal and external stakeholders, including representatives of the socio-economic environment, graduates, students, academic staff, and members

of the Business Council cooperating with the Faculty. The consultations were conducted through direct meetings, correspondence exchange, and the analysis of opinions and recommendations submitted by stakeholders.

Particular attention during the consultation process was paid to aligning the learning outcomes with current labour market needs, developing practical competences, and incorporating current technological and organisational trends relevant to the field of process engineering. Stakeholders particularly emphasised the need to strengthen the practical dimension of education, including team-based projects and classes carried out in cooperation with external partners.

The conclusions resulting from the consultations were taken into account in the development of the final version of the study programme, which contributed to increasing its relevance, usefulness, and consistency with labour market needs as well as the expectations of the socio-economic environment.

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

In accordance with the recruitment resolution in force for the given academic year, an applicant seeking admission to the second-cycle (level 7) studies in Industrial Process Engineering must hold the degree of Engineer or Master of Science in Engineering.

The unit organizing education

Faculty of Process and Environmental Engineering

Education program

Semester 1

Course	Number of hours	ECTS points	Form of verification	Obligatory
Advanced Simulation Techniques in Process Engineering	Laboratory classes: 75 Project work: 30	9	Exam	Obligatory
Production Systems in Process Engineering	Seminar: 10 Laboratory classes: 6 Project work: 34 Lecture: 45	8	Graded assignment	Obligatory
Foreign Language - Scientific Skills	Tutorials: 45	2	Graded assignment	Obligatory subjects to choose from
Elective Course 1		5	Graded assignment	Obligatory group
The student chooses 1 subject.				
Sustainable Development in Industry	Seminar: 25 Lecture: 30	5	Graded assignment	Optional
Course of European Consortium of Innovative Universities	E-learning: 55	5	Graded assignment	Optional
Elective Course 2		6	Graded assignment	Obligatory group
The student chooses 1 subject.				
Operations in Bioprocess Engineering	Laboratory classes: 55 Project work: 15	6	Graded assignment	Optional
Application of Nanostructured Materials in Chemical Engineering	Seminar: 15 Project work: 40 Lecture: 15	6	Graded assignment	Optional
Mechanisms of Momentum, Heat and Mass Transfer	Tutorials: 30 Lecture: 40	6	Graded assignment	Optional
Sum	**370**	**30**		

Semester 2

Course	Number of hours	ECTS points	Form of verification	Obligatory
Process Optimization and Intensification	Seminar: 15 Laboratory classes: 45 Lecture: 40	7	Exam	Obligatory
Design of Industrial Processes	Seminar: 15 Project work: 70 Lecture: 30	8	Graded assignment	Obligatory
Identifying and Solving Complex Rechnological Problems (PBL)	Project work: 80	6	Graded assignment	Obligatory subjects to choose from
Experiment Planning Methodology	Laboratory classes: 15 Project work: 25 Lecture: 15	4	Graded assignment	Obligatory
Elective Course 3		5	Graded assignment	Obligatory group
The student chooses 1 subject.				
Heterophasic Reactors	Tutorials: 20 Project work: 20 Lecture: 30	5	Graded assignment	Optional
Pharmaceutical and Cosmetological Process Engineering	Laboratory classes: 18 Project work: 20 Lecture: 32	5	Graded assignment	Optional
Food Industry Process Engineering	Laboratory classes: 20 Project work: 30 Lecture: 20	5	Graded assignment	Optional
Advanced Separation Techniques	Project work: 20 Laboratory classes: 20 Lecture: 30	5	Graded assignment	Optional
Sum	**420**	**30**		

Semester 3

Course	Number of hours	ECTS points	Form of verification	Obligatory
Innovations in Chemical and Biochemical Engineering	Seminar: 15 Laboratory classes: 20 Lecture: 20	4	Graded assignment	Obligatory
Internship	Internship: 0	4	Pass	Obligatory
Diploma Seminar	Seminar: 30	2	Graded assignment + exam	Obligatory
Diploma Thesis	Diploma Thesis: 0	20	Pass	Obligatory subjects to choose from
Sum	**85**	**30**		