

Autumn 2026

Component code	Component Title	ECTS
CT00AO35	Introduction to Chemistry	2
CT00AO33	Basic Chemistry (theory part)	4
CT00AO33	Basic Chemistry (laboratory part)	2
CT00AO34	Organic Chemistry (theory part)	4
CT00AO34	Organic chemistry (laboratory part)	2
CT00AO46	Flow Dynamics and Heat Techniques	6
CT00AO47	Computer Aided Process Calculation	2
CT00AQ36	Oil Refining	5
CT00AU65	Physical Chemistry, theory part	4
CT00AU64	Physical chemistry, laboratory part	1
KT00AJ45	Thermodynamics	5
CT00AQ30	Wood Chemistry	5
CTK1028	Chemical Reaction Engineering	5
KTK1030	Laboratory Exercises in Chemical Engineering	5
CT00AU66	Mechanical Operations in Chemical Engineering (theory part)	4
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CT00AQ28	Basics of Environmental Protection	5

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Component code	Component Title	ECTS
CT00AO43	Leadership	3
CT00AO48	Chemical Engineering Project	5
CT00AQ29	Environment and Energy	5
CT00AO44	Entrepreneurship	3
CTK1033	Mass Transfer	6
CTK1036	Process Automation	5
CT00AU62	Analytical chemistry theory part	4
CT00AU63	Analytical chemistry laboratory part	2

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CT00AO35	Introduction to Chemistry	2
<p>Goal: The student understands and knows how to operate safely in laboratories. The student knows basics of equation solving principles. The student is capable to recognize and name the basic laboratory equipment and is capable to use the equipment at a laboratory. The student is capable to write a laboratory report due to Centria's instructions. Student understands the construction of natural science and the meaning of continuous learning.</p> <p>Content: Principles of laboratory work, safety at the laboratories, basic calculations and calculation routines, chemistry concepts and chemical phenomena.</p>		
CT00AO33	Basic Chemistry (theory part)	4
<p>Goal: Student can apply and estimate the values of results of both theoretical tasks and laboratory tasks. Student knows how to use different information sources critically. Student knows basic problem solving. The student can plan and evaluate their own work in laboratories (e.g., choosing equipment).</p> <p>Content: Structure of the matter, phases, periodic table, character of matter and chemical bonding, stoichiometry of chemical reactions (chemical equilibrium, acid-base -, redox -, precipitation reactions), phase changes, gas laws, concentration calculations.</p>		
CT00AO33	Basic Chemistry (laboratory part)	2
<p>Goal: Student can apply and estimate the values of results of both theoretical tasks and laboratory tasks. Student knows how to use different information sources critically. Student knows basic problem solving. The student can plan and evaluate their own work in laboratories (e.g., choosing equipment).</p> <p>Content: Structure of the matter, phases, periodic table, character of matter and chemical bonding, stoichiometry of chemical reactions (chemical equilibrium, acid-base -, redox -, precipitation reactions), phase changes, gas laws, concentration calculations.</p>		
CT00AO34	Organic Chemistry (theory part)	4
<p>Goal: Student understands the basic principles of organic chemistry, is capable to determine the concepts, knows the structures of molecules, and the typical reactions and analysis methods and can apply what she/he has learned.</p> <p>Content: Empirical formula, molecular formula and structural formula, naming and categorize the compounds and, organic chemistry reaction types (esterification, substitution-, addition- elimination- and condensation), getting familiar with instrumental analytics (UV-Vis, IR)</p>		
CT00AO34	Organic chemistry (laboratory part)	2
<p>Goal: Student understands the basic principles of organic chemistry, is capable to determine the concepts, knows the structures of molecules, and the typical reactions and analysis methods and can apply what she/he has learned.</p> <p>Content: Empirical formula, molecular formula and structural formula, naming and categorize the compounds and, organic chemistry reaction types (esterification, substitution-, addition- elimination- and condensation), getting familiar with instrumental analytics (UV-Vis, IR)</p>		
CT00AO46	Flow Dynamics and Heat Techniques	6
<p>Goal: After completing the course, the student is familiar with the flow properties of fluids and the methods of heat transfer. The student is able to perform calculations related to fluid mechanics, dimension a centrifugal pump, adjust its operation energy-efficiently and assess the risk of cavitation. The student is able to apply mass and energy balances related to flow systems and heat transfer.</p>		

Content: Fundamentals of fluid mechanics. Properties of fluids. Material and energy balance for flow systems. Dimensioning of pipelines and pumps and cavitation assessment. Heat transfer methods, heat exchangers and related calculations.		
CT00AO47	Computer Aided Process Calculation	2
Goal: The student is able to use spreadsheets in technical calculations. The student is able to create an illustrative and user friendly spreadsheet. The student is able to build a simulation model of a simple process using commercial simulation software. Content: Spreadsheet lay-out; Absolute and relative references; Most important graphical presentations; The use of built in functions; Conditional functions; Protecting a spreadsheet; Modelling using a simulation program		
CT00AQ36	Oil Refining	5
Goal: The students knows: The importance of oil products energy source globally and in different countries; The nature and origin of crude oil; Oil refining raw materials and products; The main process units and their roles in oil refineries; Supporting processes needed; The future in oil refining Content: 1. Usage and importance of Crude Oil; 2. Characterization, history and formation of Crude Oil; History of Oil refining; Different kinds of refinery feed stocks, reserves; 3. Crude Distillation; 4. Thermal processes; 5. Fluid catalytic cracking (FCC) and Thermofor Catalytic Cracking (TCC); 6. Hydrocracking; 7. Hydrotreating; 8. Catalytic Reforming; 9. Alkylation and MTBE/TAME-production; 10. Hydrogen production and purification, Acid gas removal; 11. Sulphur recovery process, Waste water treatment, Flare system and safety; 12. Clean Fuels & The future of oil refining		
CT00AU65	Physical Chemistry, theory part	4
Goal: Student recognizes and is capable to connect the basic information of physical chemistry with the contents of process technic (heat- and energy technic, mass transfer, chemical reaction technic). Student knows the relations of facts in physical chemistry. Content: The basics of kinetic and thermodynamics, electrical chemistry, calculations involving gases, equilibrium of phases, lab works.		
CT00AU64	Physical Chemistry, laboratory part	1
Goal: The student is able to work in the laboratory according to the work instructions given, taking into account safety aspects and respecting the principles of sustainable development. The student is able to apply theory in practice and to report the results of his/her work in accordance with good scientific reporting practice. Content: Bomb calorimeter, Carbon dioxide and electrochemistry laboratory work.		
KT00AJ45	Thermodynamics	5
Goal: After completing the course, the student knows the laws and basic concepts of thermodynamics. The student can read properties of fluids from thermodynamic tables and diagrams and solve material and energy balance equations. The student is able to define and calculate balance calculations for heating, cooling, evaporation and drying processes. The student is able to calculate the work and heat related to compression and expansion processes. Content: Laws of thermodynamics and calculation models. Thermodynamic systems, material and energy balance equations. Gas state equations. Thermodynamic cycles and steam power plant processes.		
CT00AQ30	Wood Chemistry	5
The structure of wood, chemistry of wood compounds, the bark of the tree and its chemistry, the chemical structure of wood and bulk, lignin, cellulose, hemicellulose, extract substances, the chemistry of cooking and bleaching, cellulose derivates.		

CTK1028	Chemical Reaction Engineering	5
<p>Goal: After completing Chemical reaction engineering - course student: is able to choose suitable reaction types for a given function; can size the reactor and select control parameters for the given system; knows the factors that affect mechanism and rates of chemical reactions; is able to compile reaction rate equation based on test results; can utilize excel in reactor design calculations</p> <p>Content: 1. Basics of reactor design; 2. Interpretation of batch reactor data; 3. Single ideal reactors; 4. Design of single reactions; 5. Homogenous reactions in parallel; 6. Reactions in series; 7. Series-parallel reactions; 8. Gas phase reactions; 9. Heat of reaction</p>		
KTK1030	Laboratory Exercises in Chemical Engineering	5
<p>The student is able to apply the information learned in the advanced course of process design and development in practice, mainly in pilot scale equipment. He also learns to evaluate to a deeper level compatibility of the measured values and differences from theory. The exercises will be done in groups of 2-4 students. Each student will compile an individual report of the experiments' results. Handling the measured values (calculation, tables, and graphical presentations) can, however, be mutual in the group. Subjects for the exercises: distillation, absorption-desorption, flooding points in columns, liquid-liquid-extraction, heat exchange, evaporation, fluidization, mixing.</p>		
CT00AU66	Mechanical Operations in Chemical Engineering (theory part)	4
<p>Goal: During the course, the student acquires basic knowledge and skills in various mechanical processes and methods, which are mainly related to the processing of minerals.</p> <p>The aim is to be able to dimension equipment at basic level after completing the course. In the laboratory part of the course, the student learns the operation, calculation and reporting of mechanical processes.</p> <p>Content: The course includes theory teaching and laboratory exercises. It includes general properties of granular material, grain size and grain size distribution. Material grinding, crushing and grinding, screening, classification. Solid separation techniques, thickening, clarification, filtration, centrifugation and cyclones. The most common enrichment methods. Dust separation as well as the most common liquid mixing equipment, mixing vessel flow patterns, evaluation of mixing efficiency and time. The most common devices and their advantages and disadvantages, as well as the most important design principles.</p>		
CT00AU67	Mechanical Operations in Chemical Engineering (laboratory part)	2
<p>Goal: The student learns the operation, calculation and reporting of mechanical processes.</p> <p>Content: 1) Crushing, grinding and screening, 2) Flocculation, 3) Filtration.</p>		
CT00AQ28	Basics of Environmental Protection	5
<p>Goal: The student knows the environmental problems and possibilities of environmental protection. The student is familiar with the central facts of ecology and natural resources.</p> <p>Content: Ecological systems and their functions, raw materials and energy, sustainable development, life-cycle analysis and environmental management will be discussed.</p>		

Spring 2027

Component code	Component Title	ECTS
CT00AO43	Leadership	3
<p>Goal: The objective of the course is to understand the factors that affect people's work behavior when one works as a manager or an employee, as an individual or as part of a group.</p> <p>Content: Leadership in the context of organization and management; The evolution of leadership; Dimensions of leadership; Philosophy and style of leadership; Organization design and the main schools of management thought; General theories of human motivation</p>		
CT00AO48	Chemical Engineering Project	5
<p>Goal: Objectives are to understand the different phases of organized project management based on complex problems in multi-field projects. The students learn to work within projects in a small team organization. Students are able to realize a small-scale laboratory project as a team. Students learn to divide workload between team members, are able to report and document the progress of the work and learn co-operation skills.</p> <p>Content: During this course the students choose a small practical chemical engineering project topic, plan, organize and execute the project in a small project team, schedule the project and divide the work load to the project team members, study the background of the project topic (literature research), report the project (oral presentations) and evaluate the results (intermediate and final reports). The course is assessed based on the project plan, intermediate and final reports and the poster presentation of the project.</p>		
CT00AQ29	Environment and Energy	5
<p>Goal: The student knows the impact of consumption of energy and production of energy on the environment. He understands the problems it causes and knows the possibilities to reduce the impact.</p> <p>Content: Energy production and energy consumption, energy resources, annealing and their effects, purifying methods, boosting methods of energy use.</p>		
CT00AO44	Entrepreneurship	3
<p>Goal: The objective of the course is to give an overview of entrepreneurship in terms of a Business Plan, covering the main issues of a business context; executive summary, strategy, marketing, financial planning and budgeting.</p> <p>Content: Making a complete Business Plan individually or in a group.</p>		
CTK1033	Mass Transfer	6
<p>Goal: The student has knowledge about equilibrium between phases and apply the knowledge in the mass transfer processes.</p> <p>Content: The Gibb's phase rule and phase equilibrium drawings in one component systems and the mathematical handling of phase equilibrium of different phases of the same substance. The vapour-liquid-equilibrium (VLE) pictures of binary mixtures in both ideal and real cases and their application in simple distillation.</p> <p>The construction of VLE drawings. Different types of physical state drawings of binary condensed systems and their meaning. The colligative properties of liquids and their mathematical handling. The most important legalities of the solubility of gases. The utilising databases in phase equilibrium problems. The course will emphasise the following unit operations of mass transfer: distillation, absorption, liquid-liquid-extraction, dissolving solids, crystallisation, handling humid gases, drying, adsorption, ion exchange.</p>		
CTK1036	Process Automation	5

Goal: The student understands the importance and possibilities of automation in process industry. The student knows the basics of classical control theory and, with the help of the theory, is able to select, tune and analyse the process control for different processes.

Content: Components used in control loops, process dynamics and process responses, transfer functions and block diagrams, frequency analysis, graphical presentations, controller tuning, evaluating control quality, common controls in process industry. The course gives also basic information about dynamic system simulation using computer software.

The objective of the course is to give the student basic information of measuring techniques. After completing the course, the student knows the drawing symbols of instruments and abbreviations used in PI charts. The course gives the starting points to the four basic measurements in process industry (temperature, pressure, flow and level). The course also gives a short survey into the actuator types used.

CT00AU62

Analytical chemistry, theory part

4

Goal: Student is capable to plan and get laboratory work done, evaluate the results and the reliability of them. Student understands the meaning of analytics in process technic.

Content: The terms and measurements related to basic analytics, sampling and the analysis process, solvent chemistry, different analysis methods (titrimetric, gravimetric and volumetric analysis, precipitation), buffer solutions and the concept of pH, instrumental analytics in theory and practice (UV-Vis, AAS, GC)

CT00AU63

Analytical chemistry, laboratory part

2

Goal: The student is able to work in the laboratory according to the work instructions given, taking into account safety aspects and respecting the principles of sustainable development. The student is able to apply theory in practice and to report the results of his/her work in accordance with good scientific reporting practice.