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Curriculum for the
Master's Programme Chemical Engineering
at the Faculty for Chemistry and Pharmacy of the University of Innsbruck

(New release 2025)

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§ 1 Allocation of the study programme

Pursuant to §54, para. 1 Universities Act 2002 – UA, the Master's Programme in Chemical Engineering is grouped among the natural science study programmes.

§ 2 Admission

(1) Admission to the Master's Programme Chemical Engineering requires the completion of a relevant bachelor's programme at a university or a university of applied science, or completion of another equivalent study programme at an approved post-secondary educational institution home or abroad.

(2) In any case, completion of the Bachelor's Programme Chemistry at the University of Innsbruck is considered a relevant study programme. The Rectorate shall decide on the existence of another relevant study programme in accordance with §64 para. 3 of the Universities Act.

(3) In order to compensate for significant differences in subject matter, supplementary examinations covering a maximum of 30 ECTS-Credits may be required, which must be taken by the end of the second semester of the master's programme.

§ 3 Qualification profile

(1) Subject-specific qualifications:

Graduates of the Master's Programme in Chemical Engineering

- have highly specialised knowledge in the field of functional and nanostructured materials, which is in line with the current state of research,
- confidently and independently apply advanced synthesis, analysis and modelling methods,
- critically and thoroughly evaluate experimental data from methods such as scanning electron microscopy, X-ray and Raman spectroscopy,
- combine theoretical models and experimental results to solve complex materials science problems,
- independently develop research designs and innovative solutions at the interfaces with other disciplines,
- reflect on the scientific, technological and social implications of material-related developments.

(2) General qualifications:

Graduates of the Master's Programme in Chemical Engineering

a. communicate scientific content clearly, in a structured manner and in a way that is appropriate for the target audience,
b. plan and manage projects independently, including in interdisciplinary teams,
c. systematically analyse complex problems and develop creative, viable solutions,
d. take responsibility for ethical and ecological aspects of scientific work,
e. have learning strategies for continuous professional and personal development,
f. are confident in international and intercultural research and work contexts.

(3) Professional qualifications:

Graduates of the Master's Programme in Chemical Engineering

a. work independently and solution-oriented on challenging tasks in research, development and quality assurance,
b. apply their expertise in technology-intensive industries such as chemistry, energy, biomedicine and optics in a practical manner,
c. take on management and coordination tasks in research and development projects,
d. meet the requirements for a relevant doctoral programme and scientific careers.

(4) Career prospects:

Graduates of the Master’s Programme in Chemical Engineering

a. work in research institutions, industry, testing institutes or technology-oriented companies,
b. contribute to the development of innovative materials, products and processes,
c. actively shape strategic future topics such as sustainability, energy efficiency and digitalisation,
d. are scientifically qualified specialists who are widely employable in national and international companies, organisations and educational institutions.

(5) The Master's programme in Chemical Engineering qualifies graduates to pursue further doctoral studies in technical, scientific or other related fields.

§ 4 Scope and duration

The Master’s Programme in Chemical Engineering covers 120 ECTS-Credits. This corresponds to a duration of the study programme of four semesters. One ECTS-Credit corresponds to a workload of 25 hours.

§ 5 Types of courses and maximum number of students per course

(1) Courses without continuous performance evaluation:

Lectures (VO) are courses held in lecture format. They introduce the research areas, methods and schools of thought for a given subject. Maximum number of students: none

(2) Courses with continuous performance evaluation:

1. Excursions (EX) conducted outside the premises of the university, serve to demonstrate and deepen course contents. Maximum number of participants: 25
2. Practical courses (PR) provide practical experience with concrete scientific tasks, complementing occupational and academic training. Maximum number of participants: 10
3. Seminars (SE) as a forum for academic discussion of the content, methods and techniques of one or more subject areas, including the presentation and discussion of student contributions. Maximum number of students: 120
4. Lectures-tutorials (VU) focus on the practical treatment of concrete scientific tasks that are discussed during the lecture parts of the course. Maximum number of participants:120

§ 6 Allocation of places in courses with a maximum number of participants

Students are selected according to the following priorities:

1. Students of the studies for which the course is compulsory and who were not able to participate in the course due to a previous selection procedure.
2. Students of studies for which the course is compulsory.
3. If the criteria in no. 1 and 2 do not suffice to regulate the admission to a course, then the time of the achievement of the prerequisites for the course will be a selection criterium.
4. If the criteria in no. 1, no. 2 and no. 3 do not suffice to regulate the admission to a course, then the arithmetic mean of the grades achieved in the prerequisite examinations will be used for registration purposes.
5. If the criteria from no. 1 to no. 4 do not suffice to regulate the admission to the course, then the places will be randomly allocated.

§ 7 Structure of the study programme

The Master's Programme in Chemical Engineering is divided into the following groups of modules:

1. Compulsory modules in chemical-engineering subjects (55 ECTS-Credits) as well as the Compulsory Modules Preparation of the Master's Thesis (7.5 ECTS-Credits) and Master's Thesis Defence (2.5 ECTS-Credits)

Compulsory Modules	h	ECTS-Credits
1. Compulsory Module: Fundamentals of Process Engineering	4	5
2. Compulsory Module: Reaction Engineering	6	10
3. Compulsory Module: Basic Operations	6	10
4. Compulsory Module: Industrial Chemistry	4	8
5. Compulsory Module: Macromolecular Process Engineering	4	8
6. Compulsory Module: Practical Course in Process Engineering	10	10
7. Compulsory Module: Chemical Industry Excursion	4	4
8. Compulsory Module: Preparation of the Master's Thesis	-	7.5
9. Compulsory Module: Master's Thesis Defence	-	2.5

2. Elective modules of the subject-specific specialisation (profile focus)

   From these elective modules, modules covering 20 ECTS-Credits are to be passed.

Elective Modules of the Subject-Specific Specialisation	h	ECTS-Credits
1. Elective Module: Profile Focus Material Processing Technology	12	20
2. Elective Module: Profile Focus Biotechnology	12	20

3. Elective Module: Advanced subject-specific specialisation and general skills.

   From this elective module, courses covering 10 ECTS-Credits are to be passed.

Elective Module: Advanced Subject-Specific Specialisation and General Skills	h	ECTS-Credits
Elective Module: Advanced Subject-Specific Specialisation and General Skills	-	10

4. Elective modules practical skills.

   Modules covering 5 ECTS-Credits are to be passed from this elective module.

Elective Modules Practical Skills	h	ECTS-Credits
1. Elective Module: Internship	-	5
2. Elective Module: Metal and Ceramic Processing for Laboratory Applications	5	5
3. Elective Module: Glass Processing for Laboratory Applications	5	5

§ 8 Compulsory and elective modules

(1) Compulsory modules:

1.	Compulsory Module: Fundamentals of Process Engineering	h	ECTS-Credits
a.	**VO Reaction Analysis** Aspects of technical reaction analysis: stoichiometry (conservation of mass, key components and reactions); thermodynamics (enthalpies, entropy and chemical equilibria); microkinetics (homogeneous, heterogeneous, catalysed); simple and complex reactions, reaction networks.	1	1.5
b.	**VO Heat and Mass Transfer** Aspects of heat and mass transfer in technical systems: dimensionless parameters (Re, Pr, Nu, Sh, etc.); kinetics of mass and heat transfer processes (molecular transport processes, diffusion in porous media, etc.); mass and energy balances	1	1.5
c.	**VO Measurement, Control and Regulation Technology** Circuit diagrams of process engineering plants; control engineering fundamentals such as P, I and D control; online and offline measurement of physical variables such as temperature, concentration, bulk height, capacity, refractive index, viscosity, effects of measurement errors	1	1
d.	**VO Fluid Mechanics** Fundamentals of fluid mechanics for incompressible and compressible fluids; relevant dimensionless parameters; coupling of fluid mechanics, viscosity and thermochemistry	1	1
	Total	**4**	**5**
	Learning Outcomes: The students are able to ad a.: evaluate technical reaction analyses based on stoichiometric principles, thermodynamic variables such as enthalpy, entropy and equilibrium states, and microscopic reaction kinetics (homogeneous, heterogeneous, catalytic), thereby analysing simple and complex reactions as well as reaction networks in a differentiated manner and applying them to technical issues. ad b.: characterise heat and mass transfer in technical systems using dimensionless parameters such as Re, Pr, Nu and Sh, explain the kinetics of molecular transport processes (including diffusion in porous media), and create mass and energy balances and critically apply them to engineering scenarios. ad c.: explain the control engineering fundamentals of process engineering plants based on P, I and D control systems, measure physical variables such as temperature, concentration, bulk height, capacity, refractive index and viscosity both online and offline, and evaluate the effects of potential measurement errors. ad d.: analyse fluid mechanics problems for incompressible and compressible fluids using relevant dimensionless parameters, interpret the coupling of fluid mechanics, thermochemistry and viscosity, and apply this knowledge to technical applications.		
	Prerequisite/s: none		

2.	Compulsory Module: Reaction Engineering	h	ECTS-Credits
a.	**VO Reactor Modelling** Reactor balancing and reactor design: material and energy balances; ideal and real chemical reactors (stirred tank, cascade, tubular reactor); residence time distributions; homogeneous and heterogeneous catalysis; complex and multiphase reactions; microreaction technology	2	4

b.	**VO Reactor Design** Reactor types (stirred tank, fixed bed, fluidised bed reactors, etc.); types of pressure vessels and calculation of wall thickness and flanges according to DIN standards; material selection for chemical reactors; aspects of combined process steps (e.g. reactive rectification) and extreme conditions (e.g. high-temperature reactions); effects of material fatigue and corrosion; plant safety	2	4
c.	**VU Model Calculation on Reaction Technology** In-depth calculation examples and exercises on balancing and modelling chemical reactors and on reactor design, including aspects of material selection, plant safety and process efficiency.	1	1
d.	**SE Conceptual Reactor Design** Provision of physical and chemical material data in process engineering, modelling and simulation, energy integration and optimisation of entire process engineering plants, software-integrated design and construction of apparatus	1	1
	Total	**6**	**10**
	Learning Outcomes: The students are able to ad a.: create reactor balances and reactor designs using material and energy balances, analyse real and ideal reactor types such as stirred tanks, cascade or tubular reactors, including residence time distributions, classify heterogeneous and homogeneous catalytic processes as well as complex and multiphase reactions, apply microreaction engineering concepts and transfer this knowledge to the modelling of technical reactors. ad b.: classify different types of chemical reactors (e.g. stirred tank reactors, fixed bed reactors, fluidised bed reactors), determine wall thicknesses and flange dimensions in accordance with DIN standards, select materials for reactors taking into account process conditions such as high-temperature reactions or reactive distillation, evaluate the effects of material fatigue and corrosion, and systematically apply plant safety concepts. ad c.: perform in-depth modelling of chemical reactors with regard to mass balance, kinetics, mass and heat transfer, and reactor design, integrating aspects such as process safety, material selection and efficiency in practice-oriented calculation examples. ad d.: In addition, they are able to perform computer-aided simulations of chemical reactors, integrate these simulations into overall systems, transfer safety-related and scaling-specific requirements into software-supported design, and construct reactors taking into account the overall design.		
	Prerequisite/s: none		

3.	**Compulsory Module: Basic Operations**	**h**	**ECTS-Credits**
a.	**VO Thermal Process Engineering** Description, dimensioning and modelling of basic thermal operations: e.g. distillation, rectification; adsorption, absorption; extraction; membrane technology, drying and crystallisation.	2	4
b.	**VO Mechanical Process Engineering** Description, dimensioning and modelling of basic mechanical operations: e.g. separation, classification and sorting processes; particle-gas and solid-liquid separation processes; mixing and stirring; fluidised bed processes and particle measurement technology.	2	4

c.	**VU Model Calculations on Unit Operations** Advanced calculation examples and exercises on basic thermal and mechanical operations	1	1
d.	**SE Conceptual Process Design** Physical-chemical material data calculations in chemical process engineering; modelling and simulation; energy integration and optimisation of entire process engineering plants; software-integrated design and construction of apparatus	1	1
	Total	**6**	**10**
	Learning Outcomes: The students are able to ad a.: describe, dimension and model basic thermal operations such as distillation, rectification, adsorption, absorption, extraction, membrane technology, drying and crystallisation, and apply this knowledge to process engineering systems. ad b.: analyse basic mechanical operations such as separation, classification and sorting processes, particle-gas and solid-liquid separations, mixing and stirring processes, and fluidised bed processes, carry out their design using computer-aided methods, and evaluate them using particle measurement techniques. ad c.: independently perform in-depth calculation exercises and modelling of basic thermal and mechanical operations and critically interpret the results in terms of technical relevance, application limits and optimisation potential. ad d.: In addition, they are able to carry out material data-based simulations of chemical processes, integrate entire process engineering plants in terms of energy, dimension them with the aid of software and, in particular, design and construct heat exchangers in a targeted manner as part of a conceptual process design.		
	Prerequisite/s: none		

4.	**Compulsory Module: Industrial Chemistry**	**h**	**ECTS-Credits**
a.	**VO Process Engineering** Process and composite structure of industrial chemical production from raw materials (petroleum, coal, natural gas, renewable raw materials) to basic and intermediate products (steam crackers, SHOP, synthesis gas, etc.) to end products; design and development of large-scale chemical processes, taking into account material, energy, safety, environmental and economic aspects.	2	4
b.	**VO Industrial Scale-Up and Process Design** In-depth knowledge of mass transfer and residence times during upscaling; film reactions and heterogeneous reactions (e.g. gas-liquid) for evaporators, bubble columns, fixed bed reactors; treatment of multi-component systems and their separation using a combination of process engineering steps and subdivision into key components.	2	4
	Total	**4**	**8**
	Learning Outcomes: The students are able to ad a.: systematically analyse the process and composite structure of industrial chemical production from raw materials such as crude oil, coal, natural gas or renewable raw materials via intermediate products such as steam cracker products, SHOP or synthesis gas products, to end products, to design large-scale processes taking into account material, energy, safety, environmental and economic aspects, and to evaluate their technical implementation. ad b.: critically assess mass transfer and residence time processes during upscaling, model heterogeneous reactions in different reactor types such as film, bubble column or fixed bed		

	reactors, separate multi-component systems using a combination of suitable process steps and develop products in a structured manner based on key functional components.
	Prerequisite/s: none

5.	Compulsory Module: Macromolecular Process Engineering	h	ECTS-Credits
a.	**VO Polymer Process Engineering** Synthesis, properties and processing of polymers and plastics on an industrial scale; polymer synthesis (chain growth, step growth, catalysis); polymer analysis (TGA, DMA, DSC, GPC, etc.); polymerisation processes (mass, solution, emulsion, suspension, gas phase, etc.); plastics process engineering (processes, reactors, processing); composite materials; modern polymer materials and processes.	2	4
b.	**VO Biochemical Engineering** Fundamentals of microbiology, kinetic models in bioreaction engineering, bioreactor technology (types, design, instrumentation); Characteristics of bioreactors (heat transfer, oxygen transfer, kLa value); operating modes (batch, fed-batch, continuous with and without cell retention, etc.), upstream and downstream processes, sterile technology.	2	4
	Total	**4**	**8**
	Learning Outcomes: The students are able to ad a.: evaluate polymers and plastics on an industrial scale in terms of synthesis, structure, properties and processing, distinguish between different polymerisation processes (mass, solution, emulsion, suspension, gas phase) and catalytic systems, apply modern methods of polymer analysis (e.g. TGA, DMA, DSC, GPC), analyse and design processes for plastics processing and the role of composite materials in the context of innovative polymer products. ad b.: apply microbiological principles and kinetic models in biotechnological processes, compare different types of bioreactors in terms of design, instrumentation and process characteristics, differentiate between operating modes such as batch, fed-batch and continuous processes, integrate upstream and downstream processes, and professionally implement requirements for sterile technology and cell retention in bioprocess engineering.		
	Prerequisite/s: none		

6.	Compulsory Module: Practical Course in Process Engineering	h	ECTS-Credits
a.	**PR Reaction Engineering Laboratory** Practical experimentation and recording of chemical engineering processes such as residence time behaviour, conversion behaviour, heterogeneous catalysis, mixing processes, bioreactors, polymerisations, etc.	5	5
b.	**PR Unit Operations Laboratory** Practical experimentation and recording of basic thermal and mechanical operations such as absorption, adsorption, extraction, crystallisation, particle characterisation using sieves, sedimentation, laser light scattering, etc.	5	5
	Total	**10**	**10**

	Learning Outcomes: The students are able to ad a.: independently conduct process-oriented laboratory experiments in reaction engineering, such as residence time behaviour, conversion behaviour, heterogeneous catalysis, mixing processes, bioreactors and polymerisation reactions, document them in protocols, analyse measurement data and evaluate the results in terms of technical relevance and scalability. ad b.: carry out practical experiments on basic thermal and mechanical operations such as absorption, adsorption, extraction, crystallisation and particle characterisation using sieving, sedimentation and laser light scattering, systematically evaluate the measurement results and draw conclusions about process engineering applications and process optimisation.
	Prerequisite/s: positive evaluation of compulsory modules 2 and 3

7.	Compulsory Module: Chemical Industry Excursion	h	ECTS-Credits
	EX Chemical Industry Excursion Multi-day excursion to companies in the chemical and materials technology industry, including factory tours and insights into production facilities and large-scale technical equipment.	4	4
	Total	**4**	**4**
	Learning Outcomes: Students are able to gain insights into the processes and structures of the chemical and materials technology industry and analyse their practical implementation, evaluate production facilities and large-scale technical equipment, link theoretical knowledge with industrial practice, critically evaluate the implementation of chemical production in real operating environments, and apply the knowledge gained to their own technical questions.		
	Prerequisite/s: positive evaluation of compulsory modules 1, 2 and 3		

8.	Compulsory Module: Preparation of the Master's Thesis	h	ECTS-Credits
	Agreement on the topic, scope and form of the Master's Thesis on the basis of a detailed literature review and a brief description of the content; agreement on the work processes and the course of study; planning of an appropriate time frame for the completion of the Master's Thesis.	-	7.5
	Total	**-**	**7.5**
	Learning Outcomes: Students are able to determine the topic, scope and form of their Master's Thesis on the basis of independent literature research and a scientifically sound brief description, develop a structured work plan with defined procedures and study progress, and design a realistic time frame for completing the Master's Thesis.		
	Prerequisite/s: positive evaluation of compulsory modules 1 to 7		

9.	Compulsory Module: Master's Thesis Defence	h	ECTS-Credits
	Presentation and defence of the Master's Thesis (Defensio) as part of an academic lecture, followed by an academic discussion and questioning by an examination board.	-	2.5
	Total	**-**	**2.5**
	Learning Outcomes: Students are able to present the theoretical and methodological foundations as well as the results of their Master's Thesis in a scientific lecture in a clear and target group-oriented manner, defend their work in the context of a scientific discussion, and answer critical questions in a well-founded manner.		
	Prerequisite/s: positive evaluation of all prescribed modules as well as the Master's Thesis		

(2) Elective modules of the subject-specific specialisation (profile focus): 20 ECTS-Credits have to be passed from the following elective modules:

1.	Elective Module: Profile Focus Material Processing Technology	h	ECTS-Credits
a.	**VO Colloids and Interfaces** Colloidal structures (suspensions, emulsions) and their interface and transport phenomena; forms of stabilisation (electrostatic, steric, etc.); zeta potential and particle size determination; surface tension and interfacial energy; process technology (encapsulation processes, composites, etc.)	2	5
b.	**VO Coating Technology** Polymer coating materials: ingredients, manufacture, application, ecological aspects; manufacturing and processing technology, taking into account economic and ecological aspects; properties and testing of coatings; applications of nanotechnology in surface coating	2	5
c.	**VO Bioinspired Materials** Bionics and biomimetics in the context of materials science and process engineering; biological polymer materials (polysaccharides, proteins, enzymes, DNA); composition and structure of biological composite materials (bones, mother-of-pearl, structural colours, etc.); bio-inspired structures (macro, micro, nano)	2	5
d.	**PR Scientific Practical Training Material Process Technology** Practical implementation of experiments in the context of current materials science research; development of own, limited research questions; scientific presentation of results followed by discussion.	3	2.5
e.	**PR Case Study – Material Process Technology** Selection and elaboration of a current topic in the context of materials processing technology; scientific presentation of the results of the case study followed by discussion.	3	2.5
	Total	**12**	**20**
	Learning Outcomes: The students are able to ad a.: describe colloidal structures such as suspensions and emulsions as well as their interfacial and transport phenomena, explain electrostatic stabilisation effects, apply methods for determining zeta potential and particle size, and assess the effects on process parameters such		

	as interfacial tension, interfacial energy and encapsulation techniques for materials such as composites. ad b.: analyse polymer coating materials in terms of their ingredients, manufacture, application and ecological assessment; select application and processing technologies from an economic and ecological perspective; interpret the properties and testing methods of coatings; and evaluate applications in surface coating nanotechnology. ad c.: understand biologically inspired materials by analysing biological polymer materials such as polysaccharides, proteins or DNA and their function in natural structures such as bones or mother-of-pearl, transfer structure-function relationships and apply biomimetic principles to the development of new materials in materials processing technology. ad d.: formulate their own research questions in the field of materials processing technology, work on them experimentally in a research laboratory, evaluate results using scientific methods, and present and discuss them in a structured manner ad e.: systematically examine a current topic in materials processing technology within the framework of a case study, present the results in writing and orally in the style of a scientific presentation, and critically reflect on them in a specialist discussion.
	Prerequisite/s: none

2.	Elective Module: Profile Focus Biotechnology	h	ECTS-Credits
a.	**VO Advanced Biotechnology I** Current topics in biotechnology, e.g. current research topics in experimentation and simulation, in-depth study of processes and production techniques – Part 1	2	5
b.	**VO Advanced Biotechnology II** Current topics in biotechnology, e.g. current research topics in experimentation and simulation, in-depth study of processes and production techniques – Part 2	2	5
c.	**VO Advanced Biotechnology III** Current topics in biotechnology, e.g. current research topics in experimentation and simulation, in-depth study of processes and production techniques – Part 3	2	5
d.	**PR Research Laboratory in Biotechnology** Practical implementation of experiments in the context of current biotechnological research; development of own, limited research questions; scientific presentation of results followed by discussion.	3	2.5
e.	**PR Case Study - Biotechnology** Selection and development of a current biotechnology topic; scientific presentation of the results of the case study followed by discussion.	3	2.5
	Total	**12**	**20**
	Learning Outcomes: The students are able to ad a.: critically analyse current biotechnological research topics in the field of experimentation and simulation, gain an in-depth understanding of modern processes and production techniques, and systematically apply them to biotechnological issues within the scope of Part 1. ad b.: further investigate complex biotechnological processes and methods, incorporating current research topics; evaluate simulation and production techniques at an advanced level and transfer them to new contexts within the framework of Part 2. ad c.: synthesise biotechnological topics from research and practice within the framework of Part 3, work on them experimentally or model-based, and place the results in a broader scientific context.		

	ad d.: develop their own research questions in the field of biotechnology, conduct experiments in the research laboratory, analyse the results using scientific methods, and present and discuss them coherently in a specialist presentation. ad e.: work on a current biotechnology topic as part of a case study, prepare the results in a professional manner and reflect on them in a scientific discussion using sound methodology.
	Prerequisite/s: none

(3) Elective Module Advanced Subject-Specific Specialisation and General Skills: 10 ECTS-Credits are to be passed from the following elective module:

1.	Elective Module: Advanced Subject-Specific Specialisation and General Skills	h	ECTS-Credits
	Courses covering 10 ECTS-Credits are to be passed:		
	a. Extension Programme Chemical Engineering Courses of the type VO that are not identical to the courses of the respective complementary profile focus (§8 para. 2 no. 1 or no. 2 resp.) of the Master's Programme in Chemical Engineering at the University of Innsbruck must be selected to the extent of 5 ECTS-Credits.		5
	b. Cross-Disciplinary Skills Chemistry A Not identical courses covering 2.5 ECTS-Credits are to be selected from the Master's Programmes in Chemistry or Materials Sciences and Nanosiences at the University of Innsbruck.		2.5
	c. Cross-Disciplinary Skills Chemistry B Not identical courses covering 2.5 ECTS-Credits are to be selected from the Master's Programmes in Chemistry or Materials Sciences and Nanosiences at the University of Innsbruck.		2.5
	d. Cross-Disciplinary Skills Pharmacy A Not identical courses covering 2.5 ECTS-Credits are to be selected from the Master's Programmes in Pharmacy or Pharmaceutical Sciences – Drug Development and Regulatory Affairs at the University of Innsbruck.		2.5
	e. Cross-Disciplinary Skills Pharmacy B Not identical courses covering 2.5 ECTS-Credits are to be selected from the Master's Programmes in Pharmacy or Pharmaceutical Sciences – Drug Development and Regulatory Affairs at the University of Innsbruck.		2.5
	f. VO Material Chemistry in Textiles Chemistry of natural and synthetic polymers for textile fibre production, surface finishing, structure and physiological properties of textile fibres, chemical modification and functionalisation, basic concepts of textile materials and manufacturing techniques	2	2.5
	g. VO Technical Textiles and Composites Chemical fundamentals and processes for the manufacture and processing of composite materials, technical textiles: materials for medical applications, filter materials, construction technology, plastics technology, lightweight vehicle construction, aerospace, conveyor technology and transport (materials, requirements, technical design)	2	2.5
	h. VO Polymer Chemistry	1	1.5

	Structure of polymeric materials, polymer reactivity, physical and chemical data of polymeric materials, technical properties, technical polymers as materials, composite materials and lightweight materials, technical textiles, functional polymers. Integrated aspects: LCA, recycling, disposal.		
	i. VO Polymer Analysis Thermal analysis (DSC, TG), sorption methods, determination of porosity, crystallinity, spectroscopic methods (IR, NMR, MS), molecular weight distribution, end group determination, microscopy	1	1
	j. VO Colouring Agents, Pigments, Additives Important polymer additives (colouring agents, pigments, plasticisers, light and ageing protection; antimicrobial products; functional additives)	1	2
	k. PR Textile Materials – Polymer Technology Characterisation of textile materials: mechanical, thermal, optical, electrical and structural properties; physical-chemical and mechanical properties of textile fibres, surfaces and composite materials; colour coordinates, concentration determination on opaque bodies, ageing tests, application simulation	2	3
	l. PR Measurement Technology and Computer-Assisted Control of Experiments Measurement technology, e.g. basic components of analogue/digital (A/D) and digital/analogue (D/A) conversion, programming in LABVIEW	3	2.5
	m. VO Intellectual Property and Regulatory Framework in the Chemical Industry Patent law, copyright law, trademark law, European chemicals law, handling and approval of chemicals and pharmaceuticals	2	2.5
	n. VU Science and Innovation Management Systematic planning, management, organisation and control of innovation processes in companies or organisations, types of innovation, idea evaluation, success factors for innovation, stage-gate process, innovation team, product development, FMEA, strategic innovation management, project definition, tools for planning, organising, implementing and controlling projects, process optimisation, workflow control of processes, case studies from the research and industrial environment.	2	2.5
	o. VU Computer-Assisted Database Research Structuring and information content of chemical science databases (SciFinder, Beilstein Reaxys, Science of Synthesis – Houben Weyl, esp@cenet, Cambridge Crystallographic Data Centre, etc.); literature search strategies, search algorithms and search profiles, data management	2	2.5
	p. SE Lecture Series GÖCh/CMBI/Material and Nanosciences Participation in lectures by invited guests as part of the series organised by the Austrian Chemical Society (GÖCh) and/or the Centre for Molecular Biosciences Innsbruck (CMBI) and/or the Centre of Excellence for Materials and Nanosciences	2	2.5
	q. Interdisciplinary Skills Courses covering 2.5 ECTS-Credits may be freely selected from the curricula of the Master's and/or Diploma Programmes established at the	-	2.5

	University of Innsbruck, provided that places are available. It is particularly recommended to attend a course dealing with gender aspects and the specialist finding of women's and gender studies.		
	Total	**-**	**10**
	Learning Outcomes: The students are able to: ad a.: analyse advanced concepts and techniques from complementary courses in the alternative profile focus, apply them to solve chemical engineering problems, use newly acquired knowledge to optimise processes and increase the efficiency of process engineering applications, and integrate and critically evaluate specific content from process engineering or chemical process analysis in scientific and industrial contexts. ad b.: acquire in-depth knowledge and skills in terms of content and methodology from freely selectable courses in the Master's programmes in Chemistry or Materials and Nanosciences, combine this with their knowledge of chemical engineering, analyse interdisciplinary issues incorporating different scientific ways of thinking and working, develop innovative solutions, tailor their professional profile to their specific needs, and develop and apply key skills such as critical thinking, creativity, and effective communication skills in both their own field and across disciplines. ad c.: acquire in-depth knowledge and skills in terms of content and methodology from freely selectable courses in the Master's Programmes in Chemistry or Materials and Nanosciences, combine this with their knowledge of chemical engineering, analyse interdisciplinary issues incorporating different scientific ways of thinking and working, develop innovative solutions, tailor their professional profile to their specific needs, and develop and apply key skills such as critical thinking, creativity, and effective communication skills in both their own field and across disciplines. ad d.: combine specialised content from Master's Programmes in Pharmacy or Pharmaceutical Sciences – particularly in the areas of drug development and regulatory affairs – with chemical engineering knowledge in a targeted manner; apply regulatory, analytical and pharmaceutical technology perspectives to industrial processes; analyse interdisciplinary issues, integrating scientific, legal and technological as well as further developing and applying key qualifications such as precision in their work, regulatory competence and interprofessional communication. ad e.: combine specialised content from Master's Programmes in Pharmacy or Pharmaceutical Sciences particularly in the areas of drug development and regulatory affairs with chemical engineering knowledge, apply regulatory, analytical and pharmaceutical technology perspectives to industrial processes, analyse interdisciplinary issues while integrating scientific, legal and technological aspects, and further develop and apply key skills such as precision work, regulatory competence and interprofessional communication. ad f.: analyse natural and synthetic polymers in terms of their suitability for textile fibre production, assess the structural and surface properties as well as the physiological properties of textile fibres, apply chemical modification and functionalisation processes, and correctly classify the basic production techniques and material classes of textile chemistry. ad g.: explain the chemical fundamentals and processes involved in the manufacture of technical textiles and composites, evaluate material systems for applications in medicine, construction, aerospace, automotive engineering and conveyor technology in terms of properties, requirements and technical implementation, and justify the specific selection of suitable materials for each application scenario. ad h.: analyse the structure of polymeric materials and their physical and chemical properties, including polymer reactivity, technical application properties and ecological aspects such as LCA, recycling and disposal, and systematically evaluate technical polymers as materials, composite and lightweight materials, and functional polymers in the context of current applications. ad i.: apply analytical methods such as thermal analysis, sorption methods, porosity and crystallinity determination, IR, NMR and mass spectrometry, end group determination,		

	molecular weight distributions and microscopy to polymeric materials and to evaluate their suitability for structural and functional characterisation in a well-founded manner. ad j.: explain the chemical fundamentals of textile materials, including natural and synthetic polymers for fibre production, surface finishing, chemical modification and functionalisation, analyse the structure-property relationships of textile fibres, and systematically describe basic textile manufacturing processes. ad k.: explain the chemical and process engineering fundamentals of manufacturing technical textiles and composite materials, evaluate requirements and design variants for applications in medicine, filtration, construction engineering, vehicle manufacturing, aerospace and conveyor technology, and justify the selection of suitable materials for specific applications. ad l.: - independently analyse and evaluate measurement techniques, including identifying the basic components of A/D and D/A conversion, distinguishing between different conversion mechanisms and recognising signal disturbances; - design and implement advanced computer-based systems for experiment control, including the development of programmes in LABVIEW, the optimisation of data acquisition systems and the integration of software and hardware components; - critically reflect on the applicability and limitations of modern measurement techniques and computer-assisted experiment control in real chemical experimental environments, including the evaluation of data quality, the assessment of system latencies and the analysis of potential sources of error. ad m.: - demonstrate a critical understanding of key concepts and practices in the field of intellectual property, particularly in the context of chemistry, including patent law, copyright law and trademark law; - present comprehensive knowledge of European chemicals legislation and its implications for the handling and approval of chemicals and pharmaceuticals, including handling, approval processes and safety standards; critically analyse and evaluate the current state of practice in the field of intellectual property and regulatory frameworks in chemistry, including ongoing developments and challenges in this area. ad n.: - critically analyse and evaluate innovation processes, including systematic planning, management and control, the evaluation of innovative ideas and the identification of success factors; - initiate, plan and successfully implement scientific projects, including clear project definition, the application of appropriate tools for planning, organisation and control, and the integration of stage-gate processes; to carry out process optimisations in scientific and industrial contexts, including workflow control, the application of FMEA for product development and the analysis of case studies from the research and industrial environment. ad o.: - critically and comprehensively evaluate and reflect on key theories and methods of computer-assisted database research, including: the structuring of chemical science databases, the main features of databases such as SciFinder, Beilstein Reaxys, and Cambridge Crystallographic Data Centre, and the general structure and information content of these databases; - develop, interpret and adapt advanced and detailed strategies for searching for literature in scientific databases, including: using various search algorithms, creating effective search profiles and applying specific search techniques in specialised databases such as Science of Synthesis – Houben Weyl and esp@cenet; systematically analysing, managing and critically interpreting complex data from chemical science databases, including: evaluating the relevance and quality of data, applying data management principles and techniques, and using information resources to solve chemical science problems.

	ad p.: - critically assess current research topics in materials science, nanoscience and related disciplines and evaluate their scientific relevance. - reflect analytically on scientific presentations, interpret their key messages for their own field of study, and draw conclusions for their own research. ad q.: - recognise interdisciplinary connections and use additional qualifications in a targeted manner to deepen and individualise their subject profile. - develop a critical awareness of interdisciplinary issues and relate new skills to their own academic focus.
	Prerequisite/s: The prerequisites specified in the respective curricula are to be met.

(4) Elective modules in practical skills: 5 ECTS-Credits have to be passed from the following elective modules:

1.	**Elective Module: Internship**	**h**	**ECTS-Credits**
	In order to test and apply the knowledge, skills and competences they have acquired, as well as to gain an orientation on the conditions of professional practice and to acquire professionally relevant qualifications, students can complete an internship covering 5 ECTS-Credits (120 hours of practice and 5 hours for writing a report). The internship must be completed in an industrial company active in the field of chemistry or chemical engineering. Approval must be obtained from the Director of Studies before starting the internship. A certificate from the institution must be submitted confirming the duration, scope and content of the work performed; a report must also be written.	-	5
	Total	**-**	**5**
	Learning Outcomes: Students can apply the knowledge and skills they have acquired during their chemical engineering studies in a professional environment such as industry, plant engineering or public authorities. They identify chemical engineering problems, develop suitable solutions and carry out experiments, calculations and analyses. They understand the requirements of professional practice, recognise the importance of interdisciplinary work and link their specialist knowledge to related fields such as process engineering, materials science or environmental technology. They critically reflect on their practical experience, relate it to theoretical content and communicate the results. They evaluate their personal and professional development self-critically and give specific examples of the successful application of their skills in a professional context.		
	Prerequisite/s: study achievements covering 30 ECTS-Credits		

2.	**Elective Module: Metal and Ceramic Processing for Laboratory Applications**	**h**	**ECTS-Credits**
	PR Metal and Ceramics Processing for Laboratory Use Independent work in the precision engineering workshop	5	5
	Total	**5**	**5**
	Learning Outcomes: The students are able to: - independently deepen their specific knowledge and understanding of metal and ceramic processing, including knowledge of processes, techniques and tools used in precision engineering workshops;		

	- identify and analyse problems in precision engineering workshops using analytical skills and scientific working methods, and independently develop solutions, including the selection of suitable tools, materials and techniques for specific applications; - apply practical skills in the precision engineering workshop both independently and as part of a team in a safe, efficient and ethically responsible manner, including the manufacture, processing and modification of metal and ceramic components for laboratory applications.
	Prerequisite/s: none

3.	**Elective Module: Glass Processing for Laboratory Applications**	**h**	**ECTS-Credits**
	PR Glass Processing for Laboratory Use Independent work in the precision engineering workshop	5	5
	Summe	**5**	**5**
	Learning Outcomes: The students are able to: - apply glassblowing techniques, including recognising different types of glass, selecting appropriate techniques for specific requirements and taking safety aspects into account when working with glass; - independently design and manufacture glass apparatus for laboratory applications, including implementing specific laboratory configurations, applying joining techniques and complying with standards for laboratory apparatus; - develop and implement solutions to glass-related problems in a laboratory environment, including dealing with unforeseen challenges during glassblowing, adapting techniques to specific requirements, and integrating glass apparatus into multidisciplinary laboratory projects.		
	Prerequisite/s: none		

§ 9 Master's Thesis

(1) Within the scope of the master's programme, a Master's Thesis covering 20 ECTS-Credits is to be written. The Master's Thesis is an academic paper that serves as proof of the ability to independently work on an academic topic in an appropriate manner in terms of content and methodology.

(2) The topic of the Master's Thesis must be chosen from the field of chemical engineering. The prerequisite for announcing the topic of the Master's Thesis is the achievement of at least 55 ECTS-Credits from the compulsory and elective modules as well as the Compulsory Module Preparation of the Master's Thesis.

(3) The completed Master's Thesis must be submitted to the Director of Studies in electronic form. It must be accompanied by a sworn affidavit confirming that the rules of good scientific practice have been followed.

§ 10 Examination regulations

(1) The performance of a module is either assessed by overall examinations or by course examinations. Positive evaluation of all parts of a module examination completes the respective module.

(2) The following modules are completed by overall examinations:

- CM 1: Fundamentals of Process Engineering
- CM 2: Reaction Engineering
- CM 3: Basic Operations
- EM 1: Profile Focus Material Processing Technology

- EM 2: Profile Focus Biotechnology

The performance assessment of the courses of modules that are completed by overall examinations is carried out in one of the following ways:

1. in the case of a module that consists of lectures as well as a course with continuous performance evaluations, by the evaluation of the course with continuous performance assessment and by an overall examination covering the subject matter of the courses of the module whereby the positive assessment of the course with continuous performance evaluation is a prerequisite for being admitted to the overall examination.
2. in the case of a module that consist of lectures only, by an overall examination covering the subject matter of the lectures of the module.

(3) The performance assessment of courses of modules that are not completed by overall examinations is carried out by course examinations.

Course examinations serve to demonstrate the knowledge and skills acquired in a single course, whereby

1. in the case of courses without continuous performance evaluation, the evaluation is based on a single examination at the end of the course.
2. in the case of courses with continuous performance evaluation, the evaluation is based on at least two written, oral and/or practical contributions of the participants.

In the case of course examinations, the course instructor fixes the examination method (written/oral/practical work) and the evaluation criteria before the start of the semester.

(4) The performance in the Module Internship is evaluated by the Director of Studies on the basis of a written report about the internship. Positive evaluation reads "participated with success", negative evaluation "participated without success".

(5) The performance in Module Preparation of the Master's Thesis is evaluated by the supervisor on the basis of a synopsis. Positive evaluation reads "participated with success", negative evaluation "participated without success".

(6) The performance of the Module Master's Thesis Defence is evaluated by an oral examination before an examination board consisting of three persons.

(7) Modules and courses selected from other study programmes are subject to the examination regulations of the curriculum they are taken from.

§ 11 Academic degree

Graduates of the Master's Programme in Chemical Engineering are awarded the academic degree "Diplom-Ingenieurin" (female) or "Diplom-Ingenieur" (male), abbreviated as "Dipl.-Ing." or "DI.

§ 12 Coming into force

This curriculum comes into force on 1 October 2025.

§ 13 Transitional provisions

(1) This curriculum applies to all students starting the Master's Programme in Chemical Engineering as of the 2025/26 winter semester.

(2) Regular students who started the Master's Programme in Chemical Engineering as published in the University of Innsbruck Bulletin of 4 April 2019, Issue 27, No. 374, last amended on 28 June 2019, issue 66, no. 579 before 1 October 2025, are entitled to finish this study programme within a maximum of six semesters from this point in time.

(3) If the Master's Programme in Chemical Engineering is not finished in time, the students will be subject to this curriculum.

(4) In any case, the students are entitled to subject to this curriculum on a voluntary basis any time.