**Note:**
The following curriculum is a consolidated version. It is legally non-binding and for informational purposes only.
The legally binding versions are found in the University of Innsbruck Bulletins (in German).

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# Complete Version as of 1 October 2019

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

## § 1 Qualification profile

(1) The Master's Programme Chemical Engineering is grouped among the natural science studies.

(2) The Master's Programme Chemical Engineering is aimed at vocational training in chemical engineering. The programme imparts the subject-specific competences and methods for scientific research as well as for responsible action as a chemical engineer. The master's programme is the basis for starting a career as chemical engineer in research, technology, industry, as well as in environment and chemical engineering-relevant fields in authorities. The graduates of the study programme are able to carry out scientific research in chemical engineering independently and in a leading role, and to use these acquired competences in an interdisciplinary way to solve issues in process engineering.

(3) The Master's Programme Chemical Engineering is the basis for a subject-related doctoral programme.

(4) The Master's Programme Chemical Engineering has been designed with a focus on current procedural research fields in close connection of theoretical training and experimental/practical competences. Graduates of the Master's Programme Chemical Engineering have a comprehensive thematical education and at the same time a specialised or advanced knowledge in fields of their interest. Besides of acquiring advanced up-to-date knowledge in chemical engineering, the master's programme also imparts interdisciplinary key competences and a sense of responsibility with regards to the benefits and risk of natural science research and applications.

## § 2 Scope and duration

The Master's Programme Chemical Engineering covers 120 ECTS-Credits. This corresponds to a duration of four semesters. One ECTS-Credit corresponds to a work load of 25 hours.

## § 3 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 decides, according to the Universities' Act, on study programmes in question or on the equivalence of a study programme passed at a post-secondary educational institution home or abroad for the admission to the Master's programme.

(3) In the event that equivalence has been established in principle but with certain qualifications missing for full equivalence, supplemental examinations may be required by the rectorate. These examinations must be passed during the respective master's programme.

## § 4 Types of courses and maximum number of participants

(1) Courses without continuous performance assessment:

**Lectures** (VO) are courses held in lecture format. They introduce the research areas, methods and schools of thought for a given subject. No maximum number of participants.

(2) Courses with continuous performance assessment:

1. **Seminars** (SE) provide in-depth treatment of scientific topics through students' presentations and discussion thereof. Maximum number of participants: 60
2. **Lectures with practical elements** (VU) focus on the practical treatment of concrete scientific tasks that are discussed during the lecture parts of the course. Maximum number of participants: 60
3. **Practical training courses** (PR) provide practical experience with concrete scientific tasks, complementing occupational and academic training. Maximum number of participants: 10

## § 5 Allocation of places in courses with a limited number of participants

In courses with a limited number of participants, course places are allocated as follows:

1. Students for whom the study duration would be extended due to the postponement are to be given priority.
2. If criterion no. 1 does not suffice for regulating the admission, then first, students for whom the course is part of a compulsory module are to be given priority, and second, students for whom the course is part of an elective module.
3. If the criteria in no. 1 and 2 do not suffice for regulating the admission, then the date of the acquisition of the course requirements is decisive.
4. If the criteria in no. 1, 2 and 3 do not suffice for regulating the admission, then the mark achieved in the module which is the direct requirement for the course is used.
5. If the criteria listed before do not suffice for regulating the admission, then the available places are raffled.

## § 6 Compulsory and elective modules

(1) The following compulsory modules covering altogether 72.5 ECTS-Credits must be passed:

| **1.** | **Compulsory Module: Chemical Reaction Technology I** | **h** | **ECTS-Credits** |
|---|---|---|---|
| **a.** | **VO Chemical Reaction Technology I**<br>Introduction to the unit processes of chemical engineering and chemical reactors (stirred tank, cascade, tubular reactor); basics of catalysis, yield and treatment/separation of multicomponent systems | 3 | 4 |
| **b.** | **VU Calculating Examples for Chemical Reactions I**<br>Numerical calculation of material properties | 1 | 1 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students acquire sound theoretical knowledge of the basics of (large-scale) chemical engineering technology, mathematical calculation and treatment of multicomponent systems, the equipment and components of a (large) chemical plants, the process steps of catalysed chemical reactions and the output and separation of product streams. | | |
| | **Prerequisites:** none | | |

| 2. | Compulsory Module: Thermal Process Engineering I | h | ECTS-Credits |
|---|---|---|---|
| | **VO Thermal Process Engineering I**<br>Introduction to thermal unit operation distillation, rectification, adsorption, absorption, extraction, membrane technology, drying and crystallisation | 4 | 5 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students know relevant thermal unit operations and interpret them graphically as well as numerically in consideration of the essential operating parameters. | | |
| | **Prerequisites:** none | | |

| 3. | Compulsory Module: Heat and Mass Transfer | h | ECTS-Credits |
|---|---|---|---|
| **a.** | **VO Mass and Energy Balances**<br>Introduction to material and energy balances, mathematical models, consideration of chemical consequences and heat flow | 1 | 1 |
| **b.** | **VO Heat and Mass Transfer**<br>Introduction to heat and mass transfer, dimensionless key figures (Re, Pr, Nu, Sh etc.), kinetics of mass and heat transport processes (molecular transport processes, diffusion in porous media, etc.), theoretical foundations (conservation equations, transport equations), numerical solution of selected problems (transport phenomena in connection with sorption, chemical reactions or degradation of components), flow models | 3 | 4 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students acquire knowledge for the fundamental treatment of substance-converting processes and for the calculation of the material and energy balance. Students are familiar with complex (one- and multi-dimensional) processes of material and heat transport processes and they can scale them into process engineering processes using numerical methods. | | |
| | **Prerequisites:** none | | |

| 4. | Compulsory Module: Solids Process Technology | h | ECTS-Credits |
|---|---|---|---|
| **a.** | **VO Solids Process Technology**<br>Introduction to the characterisation of particles and material systems in mechanical process engineering, fundamentals of separation, classifying and sorting processes, methods of particle gas and solid-liquid separation, mixing and stirring, fluidised bed processes and particle measurement technology | 3 | 3 |
| **b.** | **PR Solids Process Technology**<br>Laboratory exercise for particle characterization by sieving, sedimentation and laser light diffraction, liquid-solid separation by means of filter press, gas-solid separation by means of cyclone, fluidized bed, mixer | 1 | 2 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students learn the most important methods for the characterisation of particles as well as the essential separation processes including the associated machines and plants from the field of | | |

| | |
|---|---|
| | mechanical process engineering. |
| | **Prerequisites:** none |

| **5.** | **Compulsory Module: Chemical Reaction Technology II** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | **VO Chemical Reaction Technology II**<br>Large-scale electrochemical processes and high-temperature reactions (eg metallurgical processes, fertilizer production), calculation of plant components by means of relevant dimensionless key figures | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Students advance their knowledge of designing large-scale systems and acquire the fundamentals of the most important metallurgical manufacturing processes. | | |
| | **Prerequisites:** none | | |

| **6.** | **Compulsory Module: Reactor Design** | **h** | **ECTS-Credits** |
|---|---|---|---|
| **a.** | **VO Reactor Design**<br>Reactor types (agitator, fixed bed, fluidized bed reactor), types of pressure vessels and calculation of wall thickness and flanges to DIN standard, design criteria for bioreactors (CIP and last rinse requirements), choice of material for chemical reactors, aspects of combined process steps (e.g. reactive rectification) and extreme conditions (e.g. high temperature reactions), effect of material fatigue and corrosion, required safety measures, measures at planned and unplanned production stops | 2 | 2.5 |
| **b.** | **VO Plant Safety**<br>Basic principles of plant safety, management of technical risk, process safety management, change management, fire and explosion protection | 1 | 1 |
| **c.** | **VU Calculating Examples for Reactor Design**<br>Design and construction of chemical reactors and reactor cascades with regard to yield maximisation and material selection, calculation of pressure vessels, flanges, standardized wall thickness, taking into account external forces (Beilung, bending moments, environmental influences) | 1 | 1.5 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students acquire sound theoretical knowledge for the calculation of chemical reactors and columns, taking into account necessary security measures. Students know the technical requirements of the components of a system and can calculate them. | | |
| | **Prerequisites:** none | | |

| 7. | Compulsory Module: Thermal Process Engineering II | h | ECTS-Credits |
|---|---|---|---|
| | **VO Thermal Process Engineering II**<br>Advanced study of thermal separation processes and dimensioning of apparatuses (NTU, HTU, HETP); rectification of multi-component mixtures, reactive rectification; design of mass transfer columns for absorption and gas scrubbing; drying processes using the Mollier diagram; calculation and design of single-stage and multi-stage extraction apparatuses (counter and cross flow); design of heat exchangers | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>The students acquire in-depth expertise in basic thermal process engineering and are able to calculate complex separation tasks, design them procedurally and estimate the cost-effectiveness with regard to material and energy flows. | | |
| | **Prerequisites:** none | | |

| 8. | Compulsory Module: Thermal Process Engineering Laboratory | h | ECTS-Credits |
|---|---|---|---|
| | **PR Thermal Process Engineering Laboratory**<br>Practical experimentation of transport tasks by means of pumps and compressors, heat transfer by means of heat exchangers, separation tasks by means of absorption, adsorption, extraction, membrane technology and crystallisation | 5 | 5 |
| | **Total** | **5** | **5** |
| | **Learning Outcomes:**<br>Students gain in-depth practical knowledge of the essential processes of thermal process engineering. They are able to operate plants safely and derive the necessary design parameters from the experiments. | | |
| | **Prerequisites:** positive completion of compulsory module 7 | | |

| 9. | Compulsory Module: Biochemical Process Engineering | h | ECTS-Credits |
|---|---|---|---|
| **a.** | **VO Biochemical Process Engineering**<br>Introduction to bioreactor technology (types, setup, instrumentation), characteristics of bioreactors (heat transfer, oxygen input, kLa value), kinetic models in bioreactor technology, mode of operation (batch, fed-batch, conti with perfusion, etc.) | 3 | 4 |
| **b.** | **PR Biochemical Process Engineering Laboratory**<br>Experimental examination on process control, kinetics and modelling with the example of fermentation | 1 | 1 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students are able to apply the methods of mechanical, chemical and thermal process engineering to technically used biological reactions taking into account the specific conditions of biochemical processes. The students are able to describe bio-reaction processes mathematically. | | |
| | **Prerequisites:** none | | |

| 10. | Compulsory Module: Conceptual Process Design | h | ECTS-Credits |
|---|---|---|---|
| | **VO Conceptual Process Design**<br>Physicochemical substance data calculations in (bio) chemical process technology; modelling and simulation, energetic integration and optimisation of process engineering systems; software-integrated design and construction of heat exchangers | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Students learn the different phases of process development in process engineering:<br>basic flow diagram (definition of the function), process flow diagram (determination of physics and chemistry) and R&I flow chart (definition of the design). They are able to carry out the design of complete systems as part of a conceptual design using computer-assisted process simulations and process optimisations. | | |
| | **Prerequisites:** none | | |

| 11. | Compulsory Module: Chemical Reaction Technology Laboratory | h | ECTS-Credits |
|---|---|---|---|
| | **PR Chemical Reaction Technology Laboratory**<br>Selected application examples of chemical engineering such as filtration (pressure, microfiltration, reverse osmosis), ion exchange, electrochemistry, bioreactors | 5 | 7.5 |
| | **Total** | **5** | **7.5** |
| | **Learning Outcomes:**<br>The students apply their theoretical knowledge to practical systems and acquire skills in project and time management as well as team dynamics. | | |
| | **Prerequisites:** positive completion of compulsory module 1 | | |

| 12. | Compulsory Module: Applied Fluid Mechanics | h | ECTS-Credits |
|---|---|---|---|
| | **VO Applied Fluid Mechanics**<br>Fundamentals of fluid mechanics for incompressible and compressible fluids; advanced knowledge of CFD modelling of fluid systems; coupling of fluid mechanics, viscosity and thermochemistry and their relevance for the phase field simulation of emulsions and solidification processes; mathematical methods for calculating the viscosity of (semi-crystalline) polymer solutions | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Students learn the basics of fluid mechanics and viscosity with regard to CFD-modelling and their relation to other transport phenomena. | | |
| | **Prerequisites:** none | | |

| 13. | Compulsory Module: Measurement and Control Technology | h | ECTS-Credits |
|---|---|---|---|
| | **VO Measurement and Control Technology**<br>Schematics of process engineering plants; regulatory basics such as P, I, D control; on- and offline measurement of physical parameters such as temperature, concentration, bed height, capacity, refractive index, viscosity, effects of measurement errors and error propagation to quantify the confidence range (uncertainty quantification) | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Students acquire knowledge of modern and continuous measuring methods in technical systems, they can read process diagrams and evaluate the relevance of control methods. | | |
| | **Prerequisites:** none | | |

| 14. | Compulsory Module: Polymer Materials | h | ECTS-Credits |
|---|---|---|---|
| **a.** | **VO Polymer Chemistry**<br>Structure of polymeric materials, polymer reactivity, physical and chemical data of polymeric materials, technical properties, engineering polymers as materials, composites and lightweight materials, engineering textiles, functional polymers. Integrated aspects: LCA, recycling, disposal | 1 | 1.5 |
| **b.** | **VO Polymer Analytics**<br>Thermal analysis (DSC, TG), sorption methods, determination of porosity, crystallinity, spectroscopic methods (IR, NMR, MS), molecular weight distribution, end-group determination, microscopy | 1 | 1 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>The students are familiar with the chemical and structural properties of polymer materials, understand the theoretical concepts of the description of polymeric solids and know the basics of technical processing. | | |
| | **Prerequisites:** none | | |

| 15. | Compulsory Module: Computerised Process Engineering | h | ECTS-Credits |
|---|---|---|---|
| **a.** | **VO Computerised Process Engineering**<br>Digital methods using relevant software for the calculation of process engineering processes (distillation, absorption, adsorption, viscosity measurements, optical methods, etc.), technical thermochemistry and UNIFACT models related to current topics (Industry 4.0, Big Data) | 2 | 3 |
| **b.** | **PR Calculations in Computerised Process Engineering**<br>Calculations accompanying the lecture | 1 | 2 |
| | **Total** | **3** | **5** |
| | **Learning Outcomes:**<br>Students advance their theoretical and practical knowledge of process engineering processes using computer-based methods. | | |
| | **Prerequisites:** none | | |

| 16. | Compulsory Module: Preparation of the Master's Thesis | h | ECTS-Credits |
|---|---|---|---|
| | Agreement on the topic, the scope and the form of the Master's Thesis on the basis of a brief summary of the contents (abstract) as well as agreement on the work processes and the study progress. Planning of an appropriate time frame for the completion of the Master's Thesis. | - | 7.5 |
| | **Total** | **-** | **7.5** |
| | **Learning Outcomes:**<br>After successful completion of this module, the students will be able to write a brief summary of the content of the planned Master's Thesis (abstract), to outline an anticipated schedule and to conclude a written Master's Thesis agreement. | | |
| | **Prerequisites:** none | | |

| 17. | Compulsory Module: Master's Thesis Defense | h | ECTS-Credits |
|---|---|---|---|
| | Presentation and defense of the Master's Thesis (Defensio) within the scope of a 20-minute scientific lecture followed by a scientific discussion and questioning by an examination board | | 2.5 |
| | **Total** | | **2.5** |
| | **Learning Outcomes:**<br>The students can present and defend the results of their Master's Thesis in the form of a scientific lecture. | | |
| | **Prerequisites:** positive completion of all other compulsory and elective modules as well as the Master's Thesis | | |

(2) Elective modules covering altogether 25 ECTS-Credits must be passed. From No. 1 to 9 (advanced study) elective modules covering altogether 15 ECTS-Credits and from no. 10 to 15 (general skills) modules covering altogether 10 ECTS-Credits must be selected.

| 1. | Elective Module: Current Topics in Chemical Engineering | h | ECTS-Credits |
|---|---|---|---|
| **a.** | **VO Advanced Process Engineering I**<br>Current procedural topics, part 1 | 2 | 2.5 |
| **b.** | **VO Advanced Process Engineering II**<br>Current procedural topics, part 2 | 2 | 2.5 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>The students acquire well-founded knowledge in current research fields of chemical engineering. | | |
| | **Prerequisites:** none | | |

| 2. | Elective Module: Industrial Scale-Up and Process Design | h | ECTS-Credits |
|---|---|---|---|
| a. | **VO Industrial Scale-Up and Process Design**<br>Advanced knowledge of mass transfer and retention during upscaling; film reactions and heterogeneous reactions (e.g. gaseous-liquid) for evaporators, bubble columns, fixed bed reactors; Treatment of multi-component systems as well as their separation by means of a combination of procedural process steps and subdivision into key components | 1 | 1.5 |
| b. | **SE Industrial Scale-Up and Process Design**<br>Development of two to three small case studies of process engineering systems and their presentation | 1 | 1 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Internationalisation of knowledge in the field of chemical / thermal process engineering and development of small case studies, optimisation of presentation skills | | |
| | **Prerequisites:** none | | |

| 3. | Elective Module: Textile Materials | h | ECTS-Credits |
|---|---|---|---|
| a. | **VO Chemistry of Textile Materials**<br>Chemistry of natural and synthetic polymers for the production of textile fibres, surface finishing, structure and physiological qualities of textile fibres, chemical modification and functionalisation, basic terms of textile materials and production techniques | 2 | 2.5 |
| b. | **VO Technical Textiles and Composites**<br>Chemical fundamentals and processes for manufacturing and processing of composites, technical textiles: materials for medical applications, filter materials, building engineering, plastics technology, lightweight vehicles construction, aviation and space travel, conveyance and transport (materials, requirements, technical execution) | 2 | 2.5 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students possess fundamental an experimental knowledge on fibre polymers, composites and technical textiles, structures won from them, their characterisation, modification and the required processing techniques. | | |
| | **Prerequisites:** none | | |

| 4. | Elective Module: Colour Agents - Additives | h | ECTS-Credits |
|---|---|---|---|
| a. | **VO Colour Agents, Pigments, Additives**<br>Important polymer additives (colourants, pigments, emollients, light and aging protection, antimicrobial products, functional additives) | 1 | 2 |
| b. | **PR Textile Materials – Polymer Technology**<br>Characterisation of textile materials: mechanical, thermal, optical, electrical and structural properties; physical, chemical and mechanical properties of textile fibres, surfaces and composites; colour coordinates, determining the concentrations aging tests, application simulation | 2 | 3 |
| | **Total** | **3** | **5** |

| | |
|---|---|
| | **Learning Outcomes:**<br>Students get basic theoretical knowledge on polymer additives and colourants as well as experimental knowledge on technology of fibre polymers, structures won from them, their characterization and modification, processing techniques and material characterisation. |
| | **Prerequisites:** none |

| **5.** | **Elective Module: Coating Technology** | **h** | **ECTS-Credits** |
|---|---|---|---|
| **a.** | **VO Introduction to Coating Technology**<br>Basic aspects of coating chemistry: ingredients, paint production, applications, ecological aspects, technology of production and processing in consideration of economic and environmental aspects. Introduction to the properties and tests of coatings and applications of nanotechnology in surface coating; principles of experimental design and quality management in paint development | 2 | 2.5 |
| **b.** | **PR Formulation and Testing of Varnish**<br>Formulation, spray applications and testing of wood varnish | 2 | 2.5 |
| | **Total** | **4** | **5** |
| | **Learning Outcomes:**<br>Students acquire knowledge of the basics of coating chemistry, paint production and relevant processing technologies. | | |
| | **Prerequisites:** none | | |

| **6.** | **Elective Module: Integrating Project** | **h** | **ECTS-Credits** |
|---|---|---|---|
| **a.** | **SE Case Studies and Modelling of Chemical Processes**<br>Selection and study of a topic related to process technology | 4 | 4 |
| **b.** | **SE Case Studies**<br>Presentation of the results of the case study in process technology in the form of a scientific presentation with discussion; in German or English | 1 | 1 |
| | **Total** | **5** | **5** |
| | **Learning Outcomes:**<br>Students acquire the ability to plan, conduct and present a chemical engineering project with a focus on results on a scientific level. | | |
| | **Prerequisites:** none | | |

| **7.** | **Elective Module: Internship** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | To test and apply the acquired knowledge and skills or for orientation on the conditions of professional practice and for acquiring additional competences resp. an internship covering 5 ECTS-Credits (or 120 hours resp.) is passed. The internship must be passed in industrial businesses in materials science or in official institutions. Before starting the internship it must be approved by the Director of Studies. The institution must attest the duration, scope and contents of the internship. A report about the internship must also be written. | - | 5 |
| | **Total** | **-** | **5** |

| | |
|---|---|
| | **Learning Outcomes:**<br>Students use acquired knowledge and skills in a working environment. Having finished the module, the students know about the conditions of the professional and/or scientific practice. |
| | **Prerequisites:** approval by the Director of Studies |

| **8.** | **Elective Module: Cross-Sectional Competences for Chemistry A** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | Non-identical courses from the Master's Programme Chemistry or the Master's Programme Materials Sciences and Nanosciences at the University of Innsbruck corresponding to 2.5 ECTS-Credits must be selected. | | 2.5 |
| | **Total** | | **2.5** |
| | **Learning Outcomes:**<br>Advanced qualification of the students according to their own choice. | | |
| | **Prerequisites:** The requirements specified by the respective curricula must be met. | | |

| **9.** | **Elective Module: Cross-Sectional Competences for Chemistry B** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | Non-identical courses from the Master's Programme Chemistry or the Master's Programme Materials Sciences and Nanosciences at the University of Innsbruck corresponding to 5 ECTS-Credits must be selected. | | 5 |
| | **Total** | | **5** |
| | **Learning Outcomes:**<br>Advanced qualification of the students according to their own choice. | | |
| | **Prerequisites:** The requirements specified by the respective curricula must be met. | | |

| **10.** | **Elective Module: Intellectual Property Rights and Legal Framework of Chemistry** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | **VO Intellectual Property Rights and Legal Framework of Chemistry: Patent and Chemical Laws**<br>Copyright, trademark law, patent law, Austrian and European chemicals law, assessment and licence authorisation of chemicals and active ingredients | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Students acquire an understanding of the intellectual property rights relevant for chemical scientists and get an overview of the legal regulations in relation to chemicals. | | |
| | **Prerequisites:** none | | |

| **11.** | **Elective Module: Project Management** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | **VU Project Management**<br>Project definition, project management approaches and processes, practice-orientated tools for planning, organising, implementing and controlling projects; chemistry-relevant examples from the fields of research and industry | 2 | 2.5 |
| | **Total** | **2** | **2.5** |

| | |
|---|---|
| | **Learning Outcomes:**<br>Students understand the importance, methodology and factors of success of modern project management and learn to apply management processes and helpful tools for their own projects. The acquired competences make it possible for the students to assume an active role in project organisation. |
| | **Prerequisites:** none |

| **12.** | **Elective Module: Lecture Series GÖCh/CMBI/Material and Nanoscience** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | **SE Lecture Series GÖCh/CMBI/Material and Nanoscience**<br>Participation in lectures of invited guests within the scope of the series of the Society of Austrian Chemists (GÖCh) and/or the Centre for Molecular Bio Sciences in Innsbruck (CMBI) and/or the focus in Material and Nano Science. | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Through participation in the lecture series students are familiarised with the current research topics of external experts and learn how current topics are presented and discussed on a scientific level. Contact with the invited professors allows students to get to know the Scientific Community. | | |
| | **Prerequisites:** none | | |

| **13.** | **Elective Module: Interdisciplinary Skills** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | Providing the availability of places, courses corresponding to 5 ECTS-Credits can be selected from the curricula of the Master's and Diploma programmes at the University of Innsbruck. It is particularly recommended to take courses in which gender aspects and the results of women's and gender studies are dealt with. | | 5 |
| | **Total** | | **5** |
| | **Learning Outcomes:**<br>Advanced qualification as chosen by the student | | |
| | **Prerequisites:** The registration requirements specified by the respective curricula must be met. | | |

| **14.** | **Elective Module: Computer-Aided Database Research** | **h** | **ECTS-Credits** |
|---|---|---|---|
| | **VU Computer-Aided Database Research**<br>Structure and information content of chemical-science databases (SciFinder, Beilstein Reaxys, Science of Synthesis – Houben Weyl, esp@cenet, Cambridge Crystallographic Data Centre etc.); strategies of literature research, search algorithms and search profiles, data management | 2 | 2.5 |
| | **Total** | **2** | **2.5** |
| | **Learning Outcomes:**<br>Students acquire application-orientated knowledge of the information contents and the information search in chemistry-related databases. | | |
| | **Prerequisites:** none | | |

| 15. | Elective Module: Measurement Technology and Computer-Assisted Control of Experiments | h | ECTS-Credits |
|---|---|---|---|
| | **PR Measurement Technology and Computer-Assisted Control of Experiments**<br>Measurement technology, e.g. basic components of A/D- and D/A conversion, programming in LABVIEW | 3 | 2.5 |
| | **Total** | **3** | **2.5** |
| | **Learning Outcomes:**<br>Participants get to know hard- and software (programming) for capturing measurement data and controlling experiments. | | |
| | **Prerequisites:** none | | |

| 16. | Elective Module: Metal and Ceramics Processing for Laboratory Use | h | ECTS-Credits |
|---|---|---|---|
| | **PR Metal and Ceramics Processing for Laboratory Use**<br>Independent work in the precision-mechanic workshop | 5 | 5 |
| | **Total** | **5** | **5** |
| | **Learning Outcomes:**<br>Participants learn methods or acquire skills resp. of precision mechanics and are able to independently make their own mechanic precision elements and apparatuses. | | |
| | **Prerequisites:** none | | |

| 17. | Elective Module: Glass Processing for Laboratory Use | h | ECTS-Credits |
|---|---|---|---|
| | **PR Glass Processing for Laboratory Use**<br>Independent exercising of glass-blowing and making of glass equipment needed in the laboratory | 5 | 5 |
| | **Total** | **5** | **5** |
| | **Learning Outcomes:**<br>Participants learn methods of glass processing and are able to independently make glass equipment for laboratories. | | |
| | **Prerequisites:** none | | |

## § 7 Master's Thesis

(1) Within the scope of the Master's Programme a Master's Thesis corresponding to 22.5 ECTS-Credits must be written. The Master's Thesis is a scientific work that testifies to the student's ability to work on a scientific topic independently and adequately with regards to content and methodology.

(2) The topic of the Master's Thesis is to be chosen from the field of Chemical Engineering. Before announcing the topic of the Master's Thesis, the student must provide evidence of having passed a minimum of 60 ECTS-Credits in compulsory and elective modules.

(3) Master's Theses are to be presented in written and electronic forms as specified by the Director as Studies.

(4) To enable the students to complete writing the Master's Thesis within 6 months (corresponds to 30 ECTS-Credits) acc. to §81 (2) Universities Act, the students must pass the "Preparation of the Master's Thesis" (corresponding to 7.5 ECTS-Credits) prior to working on their Master's Thesis (22.5 ECTS-Credits). The study programme is completed with the Master's Thesis Defense (corresponding to 2.5 ECTS-Credits).

## § 8 Examination regulations

(1) Modules are assessed by module examinations. Module examinations are examinations that serve to show the knowledge and skills gained in a module. The module is completed by positive completion of all parts of a module examinations.

(2) Courses of modules are assessed by course examinations. Course examinations are

1. Examinations that assess the knowledge and skills covered by an individual course and where the performance is assessed by a single examination at the end of the course. The course lecturer must communicate the examination method (written or oral) before the start of the course.
2. Courses with continuous performance assessment, for which the performance assessment is based on regular written and/or oral contributions by the participants.

(3) Course lecturers must inform the students on the targets, contents and methods of their course in a suitable fashion before the start of each semester, as well as on the contents, the methods and the evaluations criteria and standards of the course examinations.

(4) The compulsory module "Internship" is evaluated by the Director of Studies based on the written report about the practice. Positive completion reads "successfully completed" and negative completion "unsuccessfully completed".

(5) The module "Preparation of the Master's Thesis" is evaluated by the supervisor of the Master's Thesis based on an abstract. Positive evaluation reads "successfully completed", negative evaluation "unsuccessfully completed".

(6) The compulsory module "Master's Thesis Defense" is evaluated by an oral examination before an examination board consisting of the three persons.

## § 9 Academic degree

Graduates of the Master's Programme Chemical Engineering are awarded the academic degree "Diploma Engineer", abbreviated as "Dipl. Ing." or "DI".

## § 10 Coming into force

(1) This curriculum comes into force on 1 October 2019.

(2) The changes of the curriculum acc. to the version of the University of Innsbruck Bulletin of 28 June 2019, Issue 66, No. 579 come into effect on 1 October 2019 and are to be applied to all students.