Curriculum for the Master's program

Environmental Systems Sciences / Climate and Environmental Monitoring

Curriculum 2023

This curriculum was approved by the Senate of Karl-Franzens-University Graz in the meeting of 28.06.2023 and by the Senate of Graz University of Technology in the meeting of 26.06.2023.

The Master's degree program in Natural Sciences is a jointly established degree program (§ 54 para. 7 UG) of Karl-Franzens-University Graz (Uni Graz) and Graz University of Technology (TU Graz) within the framework of "NAWI Graz". The legal basis for this degree program is the Universities Act (UG) and the study regulations of the statutes of University of Graz and Graz University of Technology in the currently valid version.

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I General information

§ 1 Subject of the degree program and qualification profile

The Master's degree program in Environmental Systems Sciences / Climate and Environmental Monitoring (ESS / CEM) comprises four semesters. The total number of ECTS credits is 120.
The Master's degree program in ESS / CEM is taught in English.
Graduates of this degree program are awarded the academic degree "Master of Science", abbreviated to "MSc".

(1) Subject of the study program

The Master's degree program in ESS / CEM provides a research-oriented qualification for dealing with scientific and technological aspects of climate change, related geoscientific aspects and environmentally relevant technological developments. This specialist focus is expanded with legal principles and application-oriented methods. Interdisciplinary and systems science cooperation components with structurally similar natural science, social science and economics studies in Environmental Systems Science (USW)[1] complement the course. Finally, an independently designed module with an environmental focus rounds off the curriculum with an individual focus.

(2) Qualification profile and skills

Graduates of the ESS / CEM Master's degree program have qualified knowledge in the areas of climate, characteristics and consequences of climate change, geological and geophysical processes, environmental monitoring as well as possibilities and framework conditions of sustainable environmental technology with links to the latest findings and scientific-technological options for action. With training in physical and chemical analysis and basic knowledge of programming algorithms, they have an overview of the application profile and expected changes in modern environmental technology - the prerequisite for innovative research-oriented activities based on critical evaluation of problems at the interface between technological possibilities and social concerns.

Graduates of the ESS / CEM Master's program develop the responsible application of these skills from their training in subject areas such as climate and environment, dynamic geosystems, environmental monitoring, possibilities for the use of environmentally friendly technologies, environmental management and legal foundations as well as regulation and controlling in the environmental sector. This performance profile is strengthened by practical experience in

[1] At the time of writing this curriculum, the following USW Master's degree programs are offered at the University of Graz: USW / Geographie – Angewandte Mensch-Umwelt-Forschung (USW / Geo-AMU), ESS / Economics (ESS / Eco), ESS / Sustainability and Innovation Management (ESS / SIM), and ESS / Climate Change and Transformation Science (ESS / CCTS). At the University of Graz and TU GRAZ, the Master's program Environmental Systems Sciences / Climate and Environmental Monitoring (ESS / CEM) has been established.

interdisciplinary teams, both in the analysis of tasks and the processing of projects, as well as in the use of systems science methods for the abstraction and parameterization of problem situations and the evaluation of results from the resulting processing and action options.

Graduates of the Master's degree program in ESS / CEM can be expected to be particularly effective in combining the knowledge of different disciplines: competent decisions in complex and confusing problem situations combined with well-founded argumentation towards affected target groups as well as employees and upstream departments. They can apply these skills in companies and businesses as well as in the public sector or NGOs, where they can either establish or further develop future-oriented functional areas and strategies for today's challenges.

In a responsible management position, graduates of the Master's degree program in ESS / CEM are able to deal with complex, unpredictable situations independently with adequate sustainability-oriented strategies and measures as well as manage the implementation of strategic decisions.

(3) Need and relevance of the study program for science and the job market

Typical areas of employment for graduates of the ESS / CEM Master's program:

- Teaching and research at university level,
- Evaluation and impact assessment of aspects of climate change and climate protection measures,
- Strategy development and implementation in the public sector and in companies on the way to a virtually greenhouse gas emission-free economy and society,
- Environmental analysis, environmental monitoring and environmental protection,
- Development of strategies and processes for the sustainable use of energy, waste and residual materials,
- Monitoring and optimization of resource- and energy-saving technologies,
- Development and implementation of strategies and processes for the sustainable use of raw materials, materials and energy,
- Implementation and support of REACH-relevant aspects,
- Support for geological / geoscientific projects,
- Advice and support for environmental protection facilities,
- Development of sustainable products, processes and services,
- Activities in environmentally relevant areas of the public sector,
- Environmental management in private companies and NGOs.

II General provisions

§ 2 Admission requirements

(1) The Master's degree program ESS / CEM builds on the Bachelor's degree program Umweltsystemwisenschaften / Naturwissenschaften-Technologie (USW / NAWI-Tech) - Environmental Systems Science / Natural Sciences Technology - offered by NAWI Graz. This degree program fulfills the admission requirements for the Master's degree program ESS / CEM.

(2) Studies that are not listed under para. 1 are eligible if a total of at least 120 ECTS credits have been completed from the following subject areas and at least one examination from each of the subject areas has been passed:

- Basics of chemistry
- Earth sciences and environmental analysis
- Fundamentals of physics
- Physical properties of matter
- Basics of computer-aided data processing
- Climate, environment and chemical technology
- Mathematics and statistics
- System sciences

(3) Studies that do not fall under para. 1 or para. 2 have significant subject-related differences. These can be compensated for by supplementary examinations if at least 90 ECTS credits have been completed from the subject areas specified in para. 2. A maximum of 30 ECTS credits may be prescribed as part of these supplementary examinations.

(4) In the case of studies that do not fall under para. 1 to para. 3, there are significant subject-related differences that cannot be compensated for. In this case, admission to the Master's degree program ESS / CEM is not possible.

(5) As a prerequisite for admission to the degree program, students must provide proof of the English language proficiency required to successfully complete their studies. The form of proof is specified in a regulation issued by the Rectorate.

§ 3. Allocation of ECTS credits

ECTS credits are allocated to all coursework to be completed by students. These ECTS credits are used to determine the relative proportion of the workload associated with the individual academic achievements, whereby the workload for a year must amount to 1500 real hours and 60 ECTS credits are allocated to this workload (corresponding to 25 real hours per ECTS credit). The workload comprises the self-study component and the semester hours. One semester hour corresponds to 45 minutes per teaching week of the semester.

§ 4. Structure of the degree program

The Master's degree program ESS / CEM with a workload of 120 ECTS credits comprises four semesters and has the following modular structure:

Master Environmental Systems Sciences / Climate and Environmental Monitoring (ESS / CEM)	
Module	**ECTS**
Modul A: Interdisciplinary Practice	10
Modul B: System Sciences	10
Modul C: Climate Change and Geo-Systems	10
Modul D: Environmental Monitoring	14
Modul E: Practise in Clean Technology and Sustainable Energy	8
Modul F: Legal Basics for Environmental Management	13
Modul G: Environmentally oriented Elective Subject G acc. §9	18
Master Exam	1
Master Thesis	30
Free Electives acc. §10	6
Summe	**120**

§ 5. Course types

Courses offered at the University of Graz and Graz University of Technology are regulated in the statutes of the universities.
The course types are listed in Appendix V.

§ 6. Group sizes

The following maximum numbers of participants (group sizes) are set:

Lecture (VO) Lecture part of VU	No restriction
Exercise portion of VU	Uni Graz: 25 TU Graz: 25
Exercise (UE)	Uni Graz: 25 TU Graz: 25
Laboratory exercise (LU)	6
Seminar (SE)	20
Course (KS)	Uni Graz: 15
Working group (AG)	Uni Graz: 20
Excursion (EX)	30
Field exercise (FU)	12

§ 7. Guidelines for the allocation of places for courses

(1) If more students register for a course than there are places available, students are admitted according to the following ranking procedure, whereby the individual criteria are to be applied in the order given:

a. Position of the course in the curriculum (according to §§ 8 and 9): The course is prescribed in the curriculum for which the course registration is made in the compulsory or elective modules. These courses are ranked equally and given priority over the free elective.

b. ECTS credits completed/recognized in the degree program: All achievements in the degree program for which the course is registered are taken into account for the ECTS ranking. A higher total is given priority.

c. Number of semesters required so far in the degree program: Ranking according to the number of semesters required so far within the degree program. A higher number is given priority.

d. Drawing of lots: If it is not possible to make a ranking decision on the basis of the above criteria, the decision is made by drawing lots.

Students who complete part of their studies at the universities participating in NAWI Graz within the framework of mobility programs are given priority for up to 10% of the available places.

III Study content and study program

§ 8. Modules, courses and semester allocation

The individual courses of this Master's degree program and their division into compulsory and elective modules are listed below. The knowledge, methods or skills to be taught in the modules are described in more detail in Annex I. The allocation of courses to the semester sequence is a recommendation and ensures that the sequence of courses optimally builds on previous knowledge and that the workload of the academic year does not exceed 60 ECTS credit points. The allocation of courses to the participating universities is set out in Annex II and § 9.

Master Environmental Systems Sciences / Climate and Environmental Monitoring (ESS / CEM)								
Module	**course (LV)**	**SSt**	**LV-type**	**ECTS**	**Semester, ECTS**			
					I	**II**	**III**	**IV**
Modul A: Interdisciplinary Practice								
A.1	IP - Interdisziplinäres Praktikum	6	AG	10			10	
subtotal		6		10	0	0	10	0
Modul B: System Sciences								
B.1	Data in Systems Sciences	2	VO	3	3			
B.2	Systems-Modelling and Systems-Analysis	2	VO	3		3		
	B.3 oder B4							
B.3	Data in Systems Sciences	2	SE	4			4	
B.4	Systems-Modelling and Systems-Analysis	2	SE	4			4	
subtotal		6		10	3	3	4	0
Modul C: Climate Change and Geo-Systems								
	C.1 oder C.2							
C.1	Earth Climate System and Climate Change	2	VO	3	3			
C.2	Climate Dynamics	2	VO	3	3			
C.3	Dynamic Geosystems	2	VO	3	3			
C.4	Raw Material Sciences	1.33	VO	2	2			
C.5	Environmental Records from Past to Present	1.33	VO	2	2			
subtotal		6.66		10	10	0	0	0

Modul D: Environmental Monitoring								
D.1	Environmental Monitoring	2	VO	3	3			
D.2	Environmental Analytics	1.33	VO	2	2			
D.3	Environmental Physics & Energy	2	VO	2	2			
D.4	Subsurface Flow and Transport Processes	2	VU	3	3			
D.5	Monitoring of Geomorphological Processes	2	VU	4		4		
subtotal		9.33		14	10	4	0	0
Modul E: Practise in Clean Technology and Sustainable Energy								
E.1	Lab course on Clean Technology and Sustainable Energy	6	LU	6		6		
E.2	Workshop / Seminar to Lab course on Clean Technology and Sustainable Energy	1	SE	1		1		
E.3	Field Trip Clean Technology and Sustainable Energy	1	EX	1		1		
subtotal		8		8	0	8	0	0
Modul F: Legal Basics for Environmental Management								
F.1	Environmental Management	2	VO	3	3			
F.2	International Environmental Law	2	KS	5		5		
F.3	REACH - Registration, Evaluation, Authorisation and restriction of Chemical substances	2	VO	3		3		
F.4	Workshop / Seminar REACH	2	SE	2		2		
Zwischensumme		8		13	3	10	0	0
Modul G: Environmentally oriented Elective Subject G acc. §9								
	one of the Modules H.1 - H.4 must be selected							
G.1	Individually composed Module			18				
G.2	Environmental Screening			18				
G.3	Environmental Cycles in Hydro- and Lithosphere			18				
G.4	Clean Technology and Sustainable Energy			18				
subtotal				18	2	4	7	5
Master Exam				1				1
Master Thesis				30	0	0	8	22
Free Electives acc. §10				6	2	1	1	2
overall				**120**	**30**	**30**	**30**	**30**

§ 9. Elective modules

For the elective module '**G.1 Individually composed Module**', courses worth 18 ECTS credits must be compiled and completed according to the following criteria:

a) The elective subject comprises an environmentally relevant subject with coordinated content.
b) This environmentally relevant subject is taught through one or more courses that examine the subject matter of this subject in depth.
c) These courses can - depending on the subject - be completed at any recognized university in Germany or abroad.
d) The environment-oriented elective subject must be assigned a unique title, which must be stated on the Master's certificate.
e) The chairperson of the CuKo USW decides on the admissibility (title and courses) of the environment-oriented elective subject for Graz University students; for TU students, the Dean of Studies for USW at the TU decides in advance at the student's request.

Elective Module G.1 Individually composed Module	
A list of environmentally relevant courses with a workload of 18 ECTS credit points needs to be composed. Additionally, this module has to be completed with a summarizing header and a description of to be achieved competences for decission of acceptance either by the Dean of Study in charge for USW-study programmes (TU-Students) or the Head of Curricula Commission USW (Uni Graz Students).	
•	recommended for general Study Abroad Activities
•	recommended for modules and courses of Uni Graz and TU Graz International Cooperation Programmes
•	recommended to design a Life Cycle Assessment (LCA) module
•	an option to set a personal focus

For the elective module '**G.2 Environmental Screening**', students must complete courses worth 18 ECTS credits from the following course catalog.

Elective Module G.2 Environmental Screening								
18 ECTS credit points must be selected from the course list [(*) compulsory]								
		SSt	**LV type**	**ECTS**	**Uni Graz[1]**	**TU Graz[1]**	**WS**	**SS**
G.2.1	(*) alternating: Hydrological Monitoring / Climatological Monitoring	2	VU	4	x			x
G.2.2	(*) Chemical Reactions and Kinetics in the Atmosphere	1.33	VO	2	x			x
G.2.3	Environmental Chemistry and Toxicology	1.33	SE	2	x			x
G.2.4	Analytical Strategy, Method Development & Data Interpretation 1	1.33	VU	2	x		x	
G.2.5	Water Analyses and Characterization	2	LU	2		x		x
G.2.6	Advanced Inorganic Analytical Chemistry	1.33	VO	2	x	x	x	
G.2.7	Low-Temperature Geochemistry	2	VO	3		x	x	
G.2.8	Environmental Isotope Proxies	1.5	VU	2		x	x	
G.2.9	Geotechnical Monitoring	3	VU	4		x	x	
G.2.10	Structural Health Monitoring	2	VO	3		x	x	
G.2.11	Structural Health Monitoring	2	FU	3		x	x	
G.2.12	Aqueous Geochemistry - Practical Field Course	2	EX	2		x		x
G.2.13	Special Topics in ESS / CCET	each 1		eq. 1.5	x	x	x	x
				18 ECTS credit points must be selected				

[1]Assignment of the course to the participating universities. Both universities are named if the course is offered jointly, in parallel or alternately by both universities.

Courses with the title 'Special Topics in ESS / CEM' are assigned to the elective module G.2 Environmental Screening, whereby one semester hour per week generally corresponds to 1.5 ECTS credits.

These courses are offered with characterizing subtitles of 1 or more credit hours VO, SE or UE.

Courses with different subtitles are to be counted as different courses.

For the elective module '**G.3 Environmental Cycles in Hydro- and Lithosphere**', students must complete courses worth 18 ECTS credits from the following course catalog.

Elective Module G.3 Environmental Cycles in Hydro- and Lithosphere								
credit points must be selected from the course list [(*) compulsory]								
		SSt	**LV type**	**ECTS**	**Uni Graz[1]**	**TU Graz[1]**	**WS**	**SS**
G.3.1	(*) Geodynamics of the Lithosphere	2	VO	3	x		x	
G.3.2	(*) Mineralogy and Aqueous Geochemistry	2	VO	3		x	x	
G.3.3	(*) Clay Mineralogy	1.33	VO	2		x	x	
G.3.4	(*) Biosphere's Role in Earth Systems	2	VO	3	x		x	
G.3.5	Geothermal Energy	1.33	VO	2		x		x
G.3.6	Environmental Isotope Proxies	1.5	VU	2		x	x	
G.3.7	Tectonics	2	VO	3	x		x	
G.3.8	Hydrogeochemical Modelling	2	UE	2		x		x
G.3.9	Groundwater Modelling	2	KS	2	x			x
G.3.10	Aqueous Geochemistry - Practical Field Course	2	EX	2		x		x
G.3.11	Industrial Minerals	2	EX	2		x		x
G.3.12	Special Topics in ESS / CCET	each 1		eq. 1.5	x	x	x	x
				18 ECTS	credit points must be selected			

[1]Assignment of the course to the participating universities. Both universities are named if the course is offered jointly, in parallel or alternately by both universities.

Courses with the title 'Special Topics in ESS / CEM' are assigned to the elective module G.3 Environmental Cycles in Hydro- and Lithosphere, whereby one semester hour per week generally corresponds to 1.5 ECTS credits.

These courses are offered with characterizing subtitles of 1 or more credit hours VO, SE or UE.

Courses with different subtitles are to be counted as different courses.

For the elective module '**G.4 Clean Technology and Sustainable Energy**', students must complete courses worth 18 ECTS credits from the following course catalog.

Elective Module G.4 Clean Technology and Sustainable Energy								
18 ECTS credit points must be selected from the course list [(*) compulsory]								
		SSt	**LV type**	**ECTS**	**Uni Graz[1]**	**TU Graz[1]**	**WS**	**SS**
G.4.1	(*) Environmental Technologies	3	VO	4		x	x	
G.4.2	(*) Energy Storage and Conversion	1.33	VO	2		x		x
G.4.3	(*) Physics of Sustainable Energy	2	VO	3		x	x	
G.4.4	Project Laboratory (MAS.190_x, CHE.600 (RenRes), CHE.601 (MacroMol), CHE.603 (InorgMatElChem))	8	LU	6	x	x	x	x
G.4.5	Functional Materials I	2	VO	3		x	x	
G.4.6	Introduction to Material Science	2	VO	3		x	x	
G.4.7	Batteries and Supercapacitors	3	VO	4		x		x
G.4.8	Fuel Cells and Energy Storage	2	VO	3		x		x
G.4.9	Liquid Biofuels	1	SE	1	x			x
G.4.10	Energy Systems Analysis	2	VO	3		x		x
G.4.11	Hydrogen Production and Storage	2	VO	3		x	x	
G.4.12	Advanced Studies of Polymer Electrolyte Fuel Cells	3	VU	4		x		x
G.4.13	Optical Measurements	2	VO	3	x		x	
G.4.14	Applied Radiation Physics	2	VO	3		x	x	
G.4.15	Special Topics in ESS / CCET	each 1		eq. 1.5	x	x	x	x
				18 ECTS credit points must be selected				

[1]Assignment of the course to the participating universities. Both universities are named if the course is offered jointly, in parallel or alternately by both universities.

Courses with the title 'Special Topics in ESS / CEM' are assigned to the elective module G.4 Clean Technology and Sustainable Energy, whereby one semester hour per week generally corresponds to 1.5 ECTS credits.

These courses are offered with characterizing subtitles of 1 or more credit hours VO, SE or UE.

Courses with different subtitles are to be counted as different courses.

§ 10. Free electives

(1) The courses to be completed as part of the free electives in the Master's degree program in ESS / CEM serve the individual focus and further development of the students and can be freely selected from the courses offered by all recognized domestic and foreign universities as well as recognized domestic and foreign post-secondary educational institutions. Appendix III contains a recommendation for free electives.

(2) If no ECTS credit points are allocated to a free elective subject, each semester hour (SSt) of this course is assessed with one ECTS credit point. However, if such courses are of the lecture (VO) type, 1.5 ECTS credits per credit hour shall be allocated to them.

(3) Recognition of any additional work to be completed in the area of free electives is permitted up to a maximum of 5 ECTS credits.

§ 11. Master's thesis

(1) The Master's thesis serves to demonstrate the student's ability to work on academic topics independently and in a way that is justifiable in terms of content and methodology. The task of the Master's thesis must be selected in such a way that it is possible and reasonable for the student to complete it within six months.

(2) The topic of the Master's thesis must be taken from one of the compulsory or elective modules. The responsible study law body shall decide on exceptions.

(3) The Master's thesis must be registered via the relevant dean's office with the involvement of the responsible study law body before work begins. The topic, the subject area to which the topic is assigned and the supervisor with details of the institute must be recorded.

(4) 30 ECTS credits are awarded for the Master's thesis.

(5) The Master's thesis must be submitted for assessment.

§ 12. Registration requirements for courses / examinations

Admission to the board-based Master's examination requires proof of positive assessment of all examinations in accordance with §§ 8-10 as well as the positively assessed Master's thesis

§ 13 Study Abroad and Practice

(1) Recommended studies abroad

Students are recommended to complete a semester abroad during their studies. In this Master's degree program, the individually composed environment-oriented elective subject (module G.1) is particularly suitable for this purpose. Furthermore, upon application to the responsible study law body, the achievements of shorter study stays abroad, such as active participation in international summer or winter schools, can also be recognized as part of the elective subject.

(2) Practice

Students are recommended to complete a work-oriented internship as part of the free elective subject. Each working week corresponds to 1.5 ECTS credits in terms of full-time employment. Active participation in an academic course also counts as practical experience. This internship must be approved by the responsible study-related bodies and must be a meaningful addition to the degree program.

IV Examination regulations and degree

§ 14. Examination regulations

Courses are assessed individually.

(1) Courses that are held in the form of lectures (VO) must be examined on the entire content of the course. Examinations may be exclusively oral, exclusively written or a combination of written and oral examinations.

(2) Courses held in the form of lectures with integrated exercises (VU), exercises (UE), working groups (AG), laboratory exercises (LU), field exercises (FU), seminars (SE), courses (KS) and excursions (EX) are continuously assessed on the basis of contributions made by the students and/or by accompanying tests. In any case, the assessment must consist of at least two assessments of partial performances.

(3) If a module consists of several courses, the module grade is to be determined by

a. the grade of each course belonging to the module is multiplied by the ECTS credits of the corresponding course,

b. the values calculated in accordance with lit. a. are added together,

c. the result of the addition is divided by the sum of the ECTS credits of the courses and

d. the result of the division is rounded to an integer grade if necessary. Decimal values greater than 0.5 must be rounded up, otherwise rounded down.

e. A positive module grade can only be awarded if each individual course has been assessed positively.

f. Courses whose assessment only confirms successful or unsuccessful participation are not to be included in this calculation according to a. to d. above.

(4) Regulations on the repetition of partial examinations for courses with

The regulations on the right to study are set out in the statutes.

(5) The board examination for the Master's degree consists of

- Presentation of the Master's thesis (maximum 20 minutes),
- Defense of the Master's thesis (examination interview),
- an examination from the module to which the Master's thesis is assigned, and
- an examination from another module in accordance with § 8.

(6) The topics are determined by the responsible study law body of the University of Admission at the candidate's suggestion. As a rule, the total time of the Master's examination before a committee is 60 minutes and must not exceed 75 minutes.

(7) The examination committee for the Master's examination consists of the supervisor of the Master's thesis and two other members who are nominated by the responsible study law body after hearing the candidate. The examination committee is chaired by a member of the examination committee who is not the supervisor of the Master's thesis.

(8) The grade for this board examination is determined by the examination board on the basis of the performance achieved during the Master's examination.

§ 15. Degree

(1) The Master's degree program is completed with the positive assessment of the courses of all compulsory and elective modules, the optional subject, the Master's thesis and the Master's examination before an examination board.

(2) A degree certificate must be issued upon successful completion of the degree program. The degree certificate for the Master's degree program ESS / CEM contains

a. a list of all modules according to §4 (including ECTS credits) and their assessments,

b. Title and assessment of the Master's thesis,

c. the assessment of the final board examination,

d. the total scope in ECTS credits of the free electives in accordance with § 10 and

e. the overall assessment in accordance with § 11 of the study law section of the statutes.

V Legal validity and transitional provisions

§ 16. Legal Validity

This curriculum (UNIGRAZonline / TUGRAZonline Version 2023W) comes into force on October 1, 2023.

§ 17. Transitional provisions

Students of the Master's degree program in Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET) who are subject to the 2018 curriculum when this curriculum becomes active on 1.10.2023 are entitled to complete their studies in accordance with the provisions of the 2018 curriculum by 30.9.2026. If the studies are not completed by 30.9.2026, the students are subject to the curriculum for the Master's degree program ESS / CEM in the currently valid version. Otherwise, students are entitled to voluntarily change to the new curriculum at any time within the admission deadlines. A written, irrevocable declaration to this effect must be sent to the responsible study law body.

Annex to the curriculum of the Master's degree program in Environmental Systems Sciences / Climate and Environmental Monitoring (ESS / CEM)

Appendix I.

Module descriptions

Compulsory module A	**Interdisciplinary Practice**
ECTS credits	10
Contents	• Project development / project handover • Project takeover, problem analysis, project planning • Guided project realization in teams • Argumentation of developed strategies and options for action • Summarized documentation and communication of the results • Evaluation of project implementation • Follow-up project development on the basis of results achieved
Learning objectives	After completing the module, students will be able to: • develop a project from a general factual situation and hand it over • take on an extensive project, carry out a systematic problem analysis and plan its implementation • develop methods and proposals for action in teams for sub-areas of the project plan • argue developed strategies and proposals for action • document strategies and proposals for action that have been developed • communicate summarized results of the project work • evaluate the implementation of the project • Carry out project development from the results achieved
Teaching and learning activities, -methods	• Taking on a comprehensive project assignment • Keynote speeches / presentation of problems and solutions • Group work on problem areas within the scope of the project proposal • Writing a report or manuscript according to scientific criteria • Summary presentation of the team results • (Further) project processing from the results achieved • Evaluation of project implementation
Content requirements for participation	• Project planning • Project management • Methods for problem analysis • Development of strategies and approaches to action and solutions • Simulation techniques • Scientific writing • Evaluation methods
Frequency of the module	Every semester
Compulsory module B	**System Sciences**
ECTS credits	10
Contents	• Conceptual, mathematical and computer-based system modeling • Data extraction, integration and analysis • Model and system evaluation • Conceptual and computer-based system analysis • Resilience and sustainability of systems
Learning objectives	After completing the module, students will be able to:

	• understand and be able to argue the added value and limitations of conceptual, mathematical and computer-based system modeling • design and implement computer-based models of natural, physical and social systems • extract the relevant data and integrate it into the models • evaluate the models using statistical analysis • Obtain and assess statements on the resilience and sustainability of the systems from the model evaluation • present these statements in a scientifically correct manner, both verbally and in writing • design further research independently
Teaching and learning activities, -methods	• Lecture • Collaboration on data analysis and model creation • Keynote speeches / presentation of problems and solutions • Group work on problem areas, • Writing reports or manuscripts according to scientific criteria • Summarized presentation of team results • Evaluation
Content requirements for participation	• Content of the BA courses USW-Computational Basics, System sciences 1 and Applied Systems Sciences • Understanding of the methodological characteristics of systems science • Experience with computer-based modeling (knowledge in e.g.: Python, R, Matlab, Mathemtica ...)
Frequency of the module	Each academic year

Compulsory module C	**Climate Change and Geo-Systems**
ECTS credits	10
Contents	• The Earth's climate system (basic concepts, components, phenomenology, budgets, cycles, budget principle); paleoclimate and climate history; climate observation, climate classification and network & field modeling concepts; climate physical mechanisms and geo bio chemical cycles; Earth's energy balance and anthropogenic imbalance; climate modeling, climate before prediction and climate scenarios; humans and climate in transition; physical climate change as a challenge for the economy and society (climate protection, climate change adaptation, losses & damage) • Structure and dynamics of the complex Earth system, its physical phenomena, their measurement and mathematical-physical description: seismology, earthquakes, volcanism; dynamics of the oceans, cryosphere, atmosphere; Earth's gravitational field and magnetic field. • Systematics in mineralogy; formation, properties and use of inorganic raw materials and materials; investigation of environmental and climate indicators with modern geochemical forensics and paleo-reconstruction with the application of stable isotopes with regard to element signatures and microstructural development in terrestrial, marine and technical environments.
Learning objectives	After completing the module, students will be able to: • be able to assess the scope of environmental climatology and climate science and actively apply it in key areas • be able to assess and argue anthropogenic and natural contributions to climate change and climate variability

	• be able to recognize and evaluate the effects of climate change on the economy and society • be able to assess the performance profile of modern physical and chemical examination methods • Understand the basics of geoscientific interrelationships and be able to use them to argue in technical discussions • deal with the systematics of mineralogy and be able to name the properties and utilization possibilities of inorganic raw materials • be able to assess the spectrum of geochemical investigation techniques for terrestrial, marine and technical environments ranging from forensic analysis techniques to paleo-reconstructions
Teaching and learning activities, -methods	• Lecture • Lecture notes and materials • Illustrative material and discussion
Content requirements for participation	• Basic knowledge of chemistry • Basic knowledge of physics • Basic knowledge of earth sciences
Frequency of the module	Each academic year

Compulsory module D	**Environmental Monitoring**
ECTS credits	14
Contents	• Methods for remote sensing-based environmental monitoring and possible applications of remote sensing; recording principle and evaluation of airborne scanner systems; data models, interpretation, classification and time series analysis; • Description and observation of the dynamic Earth system; • Introduction to the monitoring of geomorphological processes and selected methods and techniques, which are also applied in practice (e.g. terrestrial laser scanning, geoelectrics) and supplement theoretical knowledge with practical aspects of data acquisition, evaluation and time series analysis. • Modern chemical analysis (sampling, process analysis, remote sensing) with a focus on analytical chemistry, optical spectroscopy (IR, VIS, UV) and electron spectroscopy in a vacuum • Modern methods of physical analysis with a focus on particle measurement technology, atomic absorption spectrometry, FTIR & Raman spectroscopy, Auger and photoelectron spectroscopy, X-ray and fluorescence spectroscopy • Introduction to the performance profile of 'process' and 'evaluation'; basics of ecological evaluation of process engineering processes, products and services
Learning objectives	After completing the module, students will be able to • be able to evaluate the possibilities of recording principles and evaluation of airborne scanner systems, understand data models, perform basic interpretation of data and assess areas of application • independently apply different methods for monitoring and the permanent and systematic observation of geomorphological processes, • carry out basic evaluation steps of selected methods and techniques independently and interpret the evaluated data with regard to the research questions dealt with (time series analyses)

	• independently develop physical and chemical analytical questions, design target-oriented analytical strategies, select suitable methods and techniques and be able to assess analytical results • assess the relevance of modern biotechnology for ecological process management • be able to assess the potential and limitations of information and communication-supported technologies in the design and operation of chemical plants
Teaching and learning activities, -methods	• Lecture • Lecture notes and materials • Illustrative material and discussion • Work in groups, presentation, discussion
Content requirements for participation	• Basic knowledge of analytical chemistry (organic analysis, inorganic analysis and analysis of trace elements) and chemical laboratory experience • Basic knowledge of atomic and molecular physics; radiation laws and physical laboratory experience
Frequency of the module	Each academic year

Compulsory module E	**Practice in Clean Technology and Sustainable Energy**
ECTS credits	8
Contents	• Project-oriented experimental tasks in physical, chemical and process technology laboratories on selected tasks from the fields of environmental analysis, process control, earth sciences, materials and energy technology • Computer-aided approaches to modeling physical and chemical influences on the environment and climate as well as associated precautionary measures • Software-supported management and logistics of the use of various resources and related sustainability aspects • Accompanied independent coordination and scheduling of practical tasks • Collecting data using various analytical techniques, processing and preparing collected data, writing reports on the individual tasks; linking results obtained with literature data and critically evaluating results and methods with regard to the intended objective; assessing the accuracy and validity of results obtained • Presentation of a special aspect from the spectrum of investigations carried out as part of a poster presentation with discussion • Preparation of a manuscript according to scientific criteria with regard to sustainability aspects of the work carried out • Visits to commercial and industrial businesses and companies with written or presented follow-up and critical discussion of selected aspects
Learning objectives	After completing the module, students will be able to: • assess the possibilities of physical and chemical laboratory analysis techniques in general and evaluate some techniques in more detail based on practical experience • be able to discuss both small and large-scale physical and chemical influences on the environment and climate • identify analytical problems in complex tasks • develop a strategy for processing complex tasks with laboratory-analytical contributions • understand the idea of the basic performance range of different techniques and the accuracy of collected data and be able to distinguish between technical limits and legally defined limits

	• write reports on individual laboratory activities and, on the basis of various project-oriented experiments, write a summarizing manuscript according to scientific criteria on a given general topic • be able to prepare a specific aspect from the spectrum of practical work for a focused presentation and discussion • critically evaluate and discuss selected aspects of commercial and industrial solutions
Teaching and learning activities, -methods	• Impulse event with introduction • Practical exercises in physical and chemical laboratories • Computer-aided tasks • Accompanied organization and process planning in the team • Preparation of laboratory reports • Presentation and discussion • scientific writing • Inspection of commercial and industrial units with subsequent evaluation of selected aspects
Content requirements for participation	• Laboratory experience in chemistry and / or physics • Fundamentals of chemical analysis and spectroscopy • Experience with electronic data processing • Basics of project management • scientific writing
Frequency of the module	Each academic year

Compulsory module F	**Legal Basics for Environmental Management**
ECTS credits	13
Contents	• Environmental management: environment and framework conditions (technical, economic, ecological, sociological, legal) • Programs, concepts and methods of environmental management; standards, environmental laws/regulations and legal compliance; • Principles of environmental policy; environmental studies (Club of Rome, Global 2000, Agenda 21, Kyoto Protocol, emissions trading) • Fundamentals of environmental law, development, structure, implementation and enforcement of EU and Austrian environmental legislation • Dealing with legal databases • Introduction to the handling of plant approval procedures: Cooperation between technicians and the licensing authority • Principles, structure and objectives of REACH; the REACH procedure: Registration, evaluation, authorization and restriction of substances; chemical safety assessment and chemical safety report • Legal framework for chemical substances in the EU; tasks of the European Chemicals Agency (ECHA) • the REACH process in practice: case studies
Learning objectives	After completing the module • know the principles and framework conditions of Austrian, EU and international environmental management systems • have basic knowledge in the field of environmental law, know about the structure and dynamics of environmental legislation and are familiar with the possibilities of legal databases

	• students know how to prepare a plant or process project so that all relevant factual content can be adopted by the legal experts of a licensing authority • the students understand the REACH concept • know the safety tests and regulations for handling chemical compounds in the EU • know the mission statement and tasks of the European Chemicals Agency (ECHA) • the students have become familiar with the practice of REACH through selected case studies
Teaching and learning activities, -methods	• Lecture • Lecture notes and materials • Illustrative material and discussion • Presentation and discussion • scientific writing
Content requirements for participation	• solid ideas about the qualification profile of the course as a basis for applying the communicated content • Project management, project execution • Basic knowledge of chemistry, biology and ecology • Basic knowledge of process engineering • Basics in environmental legislation
Frequency of the module	Every academic year

Elective module G.2	**Environmental Screening**
ECTS credits	18
Contents	obligatory: • Hydrology with a focus on alpine aspects; preparation of hydrological studies • Chemical reactions and reaction kinetics in the atmosphere optional: • Environment at the molecular level, in particular the assessment of how metals and metal compounds and toxic substances are incorporated into biological systems, are distributed in different spheres, accumulate and interact with biological systems • Analytical strategies, method development and data interpretation • Hierarchy of climate models; parameterization; climate model experiments; model skill; climate projections; regional climate modelling • Fundamentals for the creation of a Global Geodetic Observing System (GGOS) to describe and observe the dynamic Earth system, based on observation techniques such as GNSS (Global Navigation Satellite Systems), VLBI (Very Long Baseline Interferometry), SLR and LLR (Satellite and Lunar Laser Ranging), satellite altimetry and satellite-based geoid determination to coordinate different frames of reference • Water analysis analyzed using various methods and technologies (EC, pH, total and carbonate hardness, redox potential, oxygen saturation, cation and anion concentrations, ion chromatography, determination of total organic carbon, UV-Vis spectroscopy, mass spectrometry - ICP-MS, optical ICP emission spectrometry - ICP-OES, etc.). • Formation and alteration of minerals and rocks in near-surface environments (e.g. carbonates, silicates, sulphides and oxides). Interpretation and assessment of geochemical

	parameters and parameters in relation to the characterization of natural and anthropogenically altered waters: saline solutions, pore, formation, ground and soil waters, etc. Stabilities and (re)formation conditions of solid phases in sedimentary, diagenetic and hydrothermal systems. • Design of measurement programs in geometrology, sensors for measuring displacements, stresses, strains and temperature for simple analysis techniques and for case studies • Development, installation and evaluation of monitoring systems for infrastructure buildings with the aim of metrologically supported maintenance to reduce costs and extend service life
Learning objectives	After completing the module, students will be able to: • understand hydrological processes in general and in alpine areas, to develop hypothesis-based investigation planning and adequate choice of investigation methods • understand the dynamics of chemical reactions in the atmosphere and the associated equilibria • independently apply different methods for monitoring or the permanent and systematic observation of geomorphological processes, whereby basic evaluation steps of selected methods and techniques can be carried out independently and the evaluated data can be interpreted. • describe chemical reactions in the environment, in particular how metals, metal compounds and toxic compounds are biologically bound, how they are distributed in the various spheres and how they accumulate • Assess data significance with Principal Component (PCA) and Cluster Analysis • be able to apply global reference frames and systems and to plan and carry out the analysis of hydrogeochemical parameters of water samples • develop and evaluate geochemical mechanisms and reaction rates for mineral/rock interactions in aqueous environments • independently design geotechnical measurement programs, carry out and evaluate measurements • be able to explain the requirements for structural health monitoring (SHM) systems and interpret the associated data.
Teaching and learning activities and methods	• Lectures, seminars, presentation • Group work on problem areas, • Summarizing presentation of (team) results
Content requirements for participation	• Fundamentals of meteorology and climatology
Frequency of the module	Each academic year

Elective module G.3	**Environmental Cycles in Hydro- and Lithosphere**
ECTS credits	18
Contents	obligatory: • Geodynamics of the lithosphere (e.g. mountain formation) • Reactions and element cycles in the dissolution and formation of minerals in natural and anthropogenic environments • Influence of fluid-dynamic and biological factors on near-surface element cycles optional • Tapping geothermal energy and deep groundwater circulation • Software-supported modeling and interpretation of aquatic environments

	• Application of element signatures and stable isotopes as indicators for the reconstruction and/or monitoring of environmental conditions and (paleo)climate • Hydrogeochemical field practical course: sampling, modern laboratory analyses, interpretation and communication of collected data • Industry excursion
Learning objectives	After completing the module • students are able to estimate and interpret analytical data on hydro- and lithospheric processes • students can describe the influence of biogenic factors on global element cycles • students are able to plan and carry out geologically / geochemically oriented case studies with regard to the extent of natural and anthropogenic influences • students have deepened their knowledge of one or more of the following topics: Geothermal energy; the use of isotopes and trace elements to track geochemical processes; modeling and interpretation of geological environments; reconstruction of contamination mechanisms of aquatic systems; sampling, modern laboratory analysis and communication of collected data; insight into mineral processing industries;
Teaching and learning activities, -methods	• Lecture • Lecture notes and materials • Development and implementation of project plans • Illustrative material and discussion • Practical exercises in analytical laboratories • Computer-aided tasks • Interaction of data analysis and model development • Presentation and argumentation of proposed methods, solution approaches and achieved results • Writing reports / scientific writing
Content requirements for participation	• Basics in chemistry, physics and mathematics • Basics in programming and the application of algorithms
Frequency of the module	Each academic year

Elective module G.4	**Clean Technology and Sustainable Energy**
ECTS credits	18
Contents	obligatory: • Cycles in technological production processes • Mass and energy balances in general, pollutant balances and balances for CO_2 , NO_x , etc in particular • Calculation of waste water and exhaust air purification systems • Recycling processes for plastics and metal-containing waste • Structure of the energy supply; renewable / fossil energy sources; • Primary energy (sun, wind, water, ambient heat, geothermal energy, biomass), secondary energy (electricity, heat, alternative fuels) • Sustainable energy storage (electrochemical, chemical, electromagnetic, mechanical, thermal) • Energy conversion technologies (fuel cells / electrolyzers, combustion engines, generators, Stirling engines, heat pumps) • Energy systems and efficiency chains • Sustainable energy and related topics: electrochemical basics; hydrogen, fuel cells, batteries and super storage; photovoltaics, wind power; fuel-powered converters, thermal power plants;

	optional: • a 6-week team training with selected aspects of physical and chemical research with state-of-the-art equipment in physics and chemistry laboratories • Electroceramics, superconductors, batteries, fuel cells and hydrogen storage options • Carbon-based raw materials of the earth's ecosystem; concepts of biorefinery and green chemistry; technologies for processing and transforming biogenic materials • Microstructure of metallic materials; characteristics and thermodynamics of crystals; steel: production, alloys, characteristics, test methods • Fuel cell technology: Thermodynamics and electrochemistry; fuel cell systems; application of fuel cells in: small portable appliances, vehicles and power plants; the polymer electrolyte fuel cell (PEFC) • Development of global energy systems; analysis of determining parameters in energy supply and energy consumption; global and local perspectives and scenarios of energy supply • Normative principles of ecological assessment of various LCA elements; application of LCA principles to processes; case studies; LCA ISO standard structure and elements; rules for eco-inventory and allocation • An overview of the different types of waste produced, as well as the options for managing this waste and the associated legal bases (such as waste management concepts or the Packaging Ordinance) • Integration of ecological and social sustainability into corporate management with a focus on the development and implementation of sustainable corporate strategies, organizational culture and sustainability strategies, instruments and methods of sustainability controlling (LCA, environmental cost accounting, key performance indicator systems) and analysis of the planning, management and control of sustainable corporate performance •
Learning objectives	After completing the module • students understand the cycles in technological production processes • can deal with mass and energy balances of technological processes in general and pollutant balances in particular • students understand calculations for wastewater and exhaust air purification in the context of technological processes • students know about recycling processes for plastics and metal-containing waste • students know the primary and secondary energy supply options • students know about the most important energy transformation technologies; • students can assess the performance profile of different energy storage technologies • students understand why there is a need for sustainable energy if the UN SDGs are to be met • students have deepened their knowledge in one or more of the following topics: 6-week practical experience in physics and chemistry laboratories with guided team work on selected aspects of current research questions; batteries, fuel cells, electroceramics; metallic compounds, steel and steel alloys; carbon-based raw materials, different scaled biorefineries and processing technologies for biogenic raw materials; development and perspective of global energy systems; ecological LCA process assessment

	• know the legal, technical and organizational principles of corporate waste management and know how waste management concepts and waste management strategies are developed, implemented and monitored • students are able to reflect on the challenges and fundamentals of sustainability management and controlling and apply the instruments of strategic and operational sustainability management and controlling
Teaching and learning activities, -methods	• Lecture • Lecture notes and materials • Illustrative material and discussion • Practical exercises in physical and chemical laboratories • Computer-aided tasks • Accompanied organization and process planning in the team • Preparation of laboratory reports • Presentation and discussion • scientific writing
Content requirements for participation	• Experience in working techniques and knowledge of safety regulations in chemistry and physics laboratories • Fundamentals of organic and inorganic chemistry • Basics of electrochemistry • Fundamentals of Physical Chemistry and Molecular Spectroscopy • Fundamentals of macromolecular chemistry and solid state physics • Fundamentals of energy systems
Frequency of the module	Each academic year

Appendix II.

Study program

1.Semester		SSt	type	ECTS	Uni Graz[1]	TU Graz[1]
B.1	Data in Systems Sciences	2	VO	3	x	
C.1 or C.2	Earth Climate System and Climate Change OR Climate Dynamics	2	VO	3	x	
C.3	Dynamic Geosystems	2	VO	3		x
D.2	Environmental Analytics	1.33	VO	2	x	
D.3	Environmental Physics & Energy	2	VO	2	x	
C.5	Environmental Records from Past to Present	1.33	VO	2	x	
C.4	Raw Material Sciences	1.33	VO	2		x
D.4	Subsurface Flow and Transport Processes	2	VO	3	x	
D.1	Environmental Monitoring	2	VO	3		x
F.1	Environmental Management	2	VO	3		x
G	Environmentally oriented Subject acc.§9			2	x	x
	Freie Wahlfächer nach.§10			2	x	x
subtotal				30		

2.Semester		SSt	type	ECTS	Uni Graz[1]	TU Graz[1]
B.2	Systems-Modelling and Systems-Analysis	2	VO	3	x	
E.1	Labcourse on Clean Technology and Sustainable Energy	6	LU	6	x	x
E.2	Workshop / Seminar to Labcourse on Clean Technology and Sustainable Energy	1	SE	1	x	x
E.3	Field Trip Clean Technology and Sustainable Energy	1	EX	1	x	x
D.5	Monitoring of Geomorphological Processes	2	VU	4	x	
F.2	International Environmental Law	2	KS	5	x	
F.3	REACH - Registration, Evaluation, Authorisation and restriction of CHemical substances	2	VO	3		x
F.4	Workshop / Seminar REACH	2	SE	2	x	
G	Environmentally oriented Subject acc. §9			4	x	x
	Freie Wahlfächer nach.§10			1	x	x
subtotal				30		

3.Semester		SSt	type	ECTS	Uni Graz[1]	TU Graz[1]
A.1	IP - Interdisciplinary Practical Training	6	AG	10	x	
B.3 or B4	Data in Systems Sciences *oder* Systems-Modelling and Systems-Analysis	2	SE	4	x	
	Masterarbeit			8	x	x
G	Environmentally oriented Subject acc. §9			7	x	x
	Freie Wahlfächer nach.§10			1	x	x
subtotal				30		

4.Semester		SSt	type	ECTS	Uni G[1]	TU[1]
	Masterprüfung			1	x	x
	Masterarbeit			22	x	x
G	Environmentally oriented Subject acc. §9			5	x	x
	Freie Wahlfächer nach.§10			2	x	x
subtotal				30		

overall	120

[1]Assignment of the course to the participating universities. Both universities are named if the course is offered jointly, in parallel or alternately by both universities.

Appendix III.

Recommended courses for the free electives

According to § 10 of this curriculum, free electives can be freely chosen from the courses offered by recognized domestic and foreign universities as well as recognized domestic and foreign post-secondary educational institutions.

In order to broaden the knowledge base in the modules of this degree program, courses from the fields of foreign languages, social competence, technology assessment and women's and gender studies are recommended. In particular, reference is made to the courses offered by the Service Facility Languages, Key Competencies and Internal Continuing Education of Graz University of Technology and Treffpunkt Sprachen of the University of Graz, the Center for Social Competence of the University of Graz, the Coordination Office for Gender Studies and Gender Equality of the University of Graz and the Science, Technology and Society Unit of Graz University of Technology.

Furthermore, reference is made to the 'TIMEGATE - Business Administration for everyone!' course offered by the Department of Corporate Leadership and Entrepreneurship at the University of Graz.

Appendix IV.

Equivalence list

For courses whose equivalence or recognition is defined in this part of the annex to the curriculum, separate recognition by the body responsible for study law matters is no longer required. Attention is drawn to the possibility of individual recognition in accordance with § 78 UG by decision of the body responsible for study law matters.

An equivalence list defines the equivalence of positively completed courses in this curriculum and the previous curriculum. This equivalence applies in both directions, i.e. positively completed courses from the previous curriculum are to be used for recognition in the current curriculum and positively completed courses from the current curriculum are to be used for recognition in the previous curriculum.

Courses with the same title, type and number of ECTS credits or semester hours are equivalent and are therefore not included in the equivalence list.

Existing curriculum 2023				Previous curriculum 2018			
Course	**LV type**	**SSt.**	**ECTS**	**Course**	**LV type**	**SSt.**	**ECTS**
C.1 Earth's Climate System and Climate Change or C.2 Climate Dynamics	VO VO	2 2	3 3	C.1 Earth Climate System and Climate Change	VO	2	3
D.1 Environmental monitoring	VO		3	E.2 Sustainable Process Technology	VO	2	3
D.4 Subsurface Flow and Transport Processes	VO	2	3	E.1 Ecological Process Evaluation	VO	2	3
D.5 Monitoring of Geomorphological Processes	VU	2	4	E.3 Introduction into Process Simulation and Process Design and E.4 Introduction into Process Simulation and Process Design	VO UE	1 2	2 2
E.1 Lab course on Clean Technology and Sustainable Energy	LU	6	6	D.1 Lab course on Clean Technology	LU	6	6
E.2 Workshop / Seminar to Lab course on Clean Technology and Sustainable Energy	SE	1	1	D.2 Workshop / Seminar to Lab course on Clean Technology	SE	1	1
E.3 Field Trip Clean Technology and Sustainable Energy	EX	1	1	D.3 Field Trip Clean Technology	EX	1	1
F.2 International Environmental Law	KS	2	5	F.2 Environmental Legislation and F.3 Plant and Process Approval	VO VO	1.33 2	2 3
G.1-4 Environmentally oriented Elective Subject acc.§9			18	H.1-4 Environmentally oriented Elective Subject acc.§9			18

Appendix V.

Course types

(1) Lectures (VO)*: They serve as an introduction to the methods of the subject area and to provide an overview and special knowledge from the established state of knowledge, from the current state of research and from special research areas of the subject.

(2) Lectures with exercises (VU)*: This involves teaching overview and specialist knowledge as well as practical skills. The courses have an inherent examination character.

(3) Exercises (UE)*: Exercises must correspond to the practical objectives of the studies and serve to solve specific tasks. The courses have an inherent examination character.

(4) Laboratory exercises (LU)*: Laboratory exercises are used to teach and practice experimental techniques and skills. The courses have an immanent examination character.

(5) Course (KS)* [Uni Gaz only]: Courses in which the students work on the course content together with the lecturers in an experience and application-oriented manner. Courses can also take place outside the place of study. The courses have an inherent examination character.

(6) Seminars (SE)*: They serve the independent scientific work and the scientific discussion about it, whereby a written elaboration of a topic and its oral presentation should be offered. A discussion is to be held on this. These courses have an inherent examination character.

(7) Working groups (AG)* [only University of Graz]: Working groups serve to jointly work on specific questions, methods and techniques of research as well as to introduce students to scientific cooperation in small groups. AGs have an immanent examination character.

(8) Field exercises (FU)* [TU Graz only] are held outside the premises of TU Graz in the field (e.g. roads, construction sites, alpine terrain, forests, tunnels) and sometimes also in inhospitable weather conditions. The students carry out the exercises largely independently after appropriate preparation.

(9) Excursions (EX)*: Excursions help to illustrate and deepen the teaching. The presentation of the course content takes place outside the study location. Excursions must be documented with reports and may also include an oral presentation of the course content by the students. Excursions can be carried out at home and abroad. The courses have an inherent examination character.

* The course types and types of courses specified in the statutes of study law (University of Graz) and guidelines (Graz University of Technology) of both universities apply.

Appendix VI

Glossary

Glossary of terms used, which are named differently in the statutes and guidelines of the two universities

Designation in this curriculum (NAWI Graz)	**Uni Graz**	**TU Graz**
SSt.	KStd.	SSt.
Free subject	Free electives	Free subject