Curriculum for the master's degree programme

Environmental System Sciences / Climate Change and Environmental Technology

Curriculum 2018

This curriculum was approved by the Senate of the University of Graz in the meeting dated May 16, 2018 and the Senate of Graz University of Technology in the meeting dated May 7, 2018.

(Please note: The English version of this document is a courtesy translation. Only the German version is legally binding.)

This scientific master's degree programme is, pursuant to § 54e Universities Act (UG), a joint degree programme between the University of Graz and Graz University of Technology as part of "NAWI Graz." This degree programme is legally based on the Universities Act of 2002 (UG) and on the provisions of the Statute of TU Graz as amended.

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I General provisions

§ 1. Object of degree programme and qualification profile

The scientific master's degree programme Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET) comprises four semesters. The total scope of the programme is 120 ECTS credit points pursuant to § 54 para. 3 Universities Act (UG).
As a foreign-language degree programme, the master's degree programme ESS/CCET will be taught in English pursuant to § 63a para. 8 UG.
Graduates of this programme are awarded the university degree of "Master of Science," abbreviated to "MSc."

(1) Object of the degree programme

Graduates of the master's program ESS / CCET acquire a research-oriented qualification for the treatment of the scientific-technological aspects of climate change, geoscientific processes and environmentally relevant technological developments. This specialised emphasis orientation is extended with legal bases and application-oriented methods, supplemented with interdisciplinary and system-oriented cooperation components with equally structured scientific, sociological and economic studies of the Environmental Systems Sciences (ESS),[1] and rounded off with an individually structured module in the curriculum as an individual focus.

(2) Qualification profile and skills

Graduates of the master's degree programme ESS / CCET possess qualified knowledge in the areas of climate, the characteristics and consequences of climate change, geoscientific processes as well as the possibilities and frameworks for sustainable environmental technology, in connection with the latest findings and potential courses of action with regard to science and technology. With a training in physical and chemical analysis as well as basic knowledge in 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 the critical assessment of problems at the interface between technological possibilities and societal concerns.

Graduated of the master's degree programme in ESS / CCET develop the ability to responsibly use these skills from their training in topics such as climate and environment, ecological process design, environmental management and legal bases as well as regulation and controlling in the environmental sector. This performance profile is reinforced by practical experience in interdisciplinary teams as well as through the analysis of tasks and working on projects, as well as the

[1] At the time of writing, this curriculum, the following ESS master's degree programmes have been established at the University of Graz: ESS / Geography, ESS / Sustainability Management and ESS / Economics. At the University of Graz and TU Graz, the master's degree programme Environmental System Sciences / Climate Change and Environmental Techonology has been established.

use of system-related methods of abstraction and parameterisation of problem situations and evaluation of results from derived options for processing/action.

Special capability may be expected of graduates of the master's degree programme in ESS / CCET when combining levels of knowledge of various disciplines: competent decisions in the event of complex and confusing problems combined with sound arguments with regard to both the target groups in question as well as employees and prior positions. They can apply these skills to companies and businesses, as well as to the public sector or NGOs, either re-establishing or further developing future-oriented functional areas and strategies for today's challenges.

In managerial positions, graduates of the master's degree programme in ESS / CCET can tackle complex, unpredictable situations independently with adequate sustainability-oriented strategies and measures as well as lead the implementation of strategic decisions.

(3) Demand for and relevance of the programme for academia and the job market

Typical fields for graduates of the master's degree programme in ESS / CCET:

- University-level teaching and research;
- Evaluation and impact assessment of aspects of climate change;
- Development of strategies and measures for climate protection, for climate change adaptation, and for losses and damage in order to tackle climate change and its consequences;
- Policy development and implementation in the public sector and in companies working towards an economy and society almost completely free of greenhouse gas emissions;
- Environmental analysis, environmental monitoring and environmental protection;
- Development of strategies and processes for sustainable energy, waste and residual material utilisation;
- Monitoring and optimisation of resource- and energy-saving technologies;
- Development and implementation of strategies and processes for the sustainable use of materials, including raw materials, and energy;
- Implementation and supervision of REACH-relevant aspects;
- Accompanied by geological / geoscientific projects;
- Consultation and support of environmental protection institutions;
- Development of sustainable products, processes and services;
- Working in environment-related areas of the public sector;
- Environmental management in private companies and NGOs.

II General requirements

§ 2. Admission requirements:

(1) (1) Admission to a master's degree programme requires a subject-related bachelor's degree of a university or university of applied sciences or another equivalent degree of a recognised Austrian or foreign post-secondary educational institution (§ 64 para. 3 UG).

(2) The master's degree programme in ESS / CCET builds on the bachelor's degree programme in Environmental Systems Sciences / Natural Sciences-Technology (USW / NAWI-Tech) offered as part of NAWI Graz. Graduates of these programmes fulfil the admission requirements for the master's degree programme in ESS / CCET. In addition, graduates of bachelor's degree programmes listed in Annex V meet the admission requirement with minor prescriptions with respect to courses of the bachelor's degree programme in Environmental Systems Sciences / Natural Sciences-Technology.

(3) If the degrees are generally equivalent and only certain supplementary qualifications are required for full equivalence, additional courses and examinations of the bachelor's degree programme in Environmental Systems Sciences / Natural Sciences-Technology with a maximum scope of 30 ECTS credit points may be prescribed in order to obtain full equivalence. Recognition of these additional qualifications to be obtained is permitted up to a maximum workload of 5 ECTS credit points for the free-choice subject pursuant to § 10.

(4) In order to obtain an overall scope of 300 ECTS credit points for the graduate and postgraduate degree programmes together, students shall not be assigned courses in the master's programme which they have already completed as part of their bachelor's degree and which were part of their qualification for the master's degree programme.

§ 3. Allocation of ECTS credit points

All achievements to be obtained by the students are assigned ECTS credit points. These ECTS credit points are used to determine the relative weight of the workload of the individual academic achievements; the workload of one year must comprise 1500 hours and 60 ECTS credit points are awarded for this workload (corresponding to a workload of 25 hours per ECTS credit point). The workload comprises the self-study part and the semester hours (SSt). One semester hour (SSt) corresponds to 45 minutes per study week of the semester.

§ 4. Organisation of the degree programme

The master's degree programme in ESS / CCET with a total workload of 120 ECTS credits comprises four semesters and is structured into modules as follows:

Master Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET)	
Modules	**ECTS**
Obligatory Module A: Interdisciplinary Practice	10
Obligatory Module B: System Sciences	10
Obligatory Module C: Climate and Environment	11
Obligatory Module D: Applied Clean Technology	8
Obligatory Module E: Ecological Process Design	10
Obligatory Module F: Environmental Management and Legal Basics	8
Obligatory Module G: REACH	5
Environmentally oriented Elective Subject H acc. §9	18
I Master Seminar and Master Exam	3
J Master Thesis	30
K Free Electives acc. §10	7
overall	**120**

§ 5. Types of courses

(1) Lecture (VO)*: Lectures serve as an introduction to the methods of the subject and for the teaching of an overview and specialised knowledge of accepted scientific findings in the field, the current state of research and the specific research areas of the subject.

(2) Lectures with integrated exercises (VU)*: These lectures comprise the teaching of an overview, specialised knowledge and practical skills. These are courses with continual assessment.

(3) Exercises (UE)*: Exercises must correspond to the practical aims of the degree programme and are designed to solve specific tasks. These are courses with continual assessment.

(4) Laboratory courses (LU)*: Laboratory courses provide knowledge and practice of experimental techniques and skills. These are courses with continual assessment.

(5) Classes (KS) [University of Graz only]*: Classes in which the students work on the course content together with the teaching staff in an experience- and application-oriented way. These classes can also be held outside of the main location of study. These are courses with continual assessment.

(6) Seminars (SE)*: Seminars are designed as independent scientific work and scientific discussion of this work, for which a topic must be elaborated in writing and presented orally. A discussion on this topic must be held. These are courses with continual assessment.

(7) Working groups (AG) * [University of Graz only]: Working groups are designed for the joint tackling of concrete research questions, methods and techniques as well as the introduction to scientific collaboration in small groups. Working groups are courses with continual assessment.

(8) Excursions (EX)*: Excursions help to exemplify and consolidate the taught content. The course content is presented outside of the university. Excursions require the completion of reports and may also include oral presentations by the students on the course content. Excursion may be carried out both at home and abroad. These are courses with continual assessment.

* The types of courses stated in the Chapter "Study Law" of the Statute (University of Graz) or Guideline (TU Graz) of the two universities shall apply.

§ 6. Group sizes

For the follow course types, the maximum number of participants (group size) is as follows:

Lectures (VO) Lecture component of VU	No limit
Exercise component of VU	Uni Graz 25 TU Graz: 25
Exercises (UE)	Uni Graz: 25 TU Graz: 25
Laboratory courses (LU)*:	D.1, H.3.3: 12
Seminars (SE)*:	15
Classes (KS)	Uni Graz: 15
Working groups (AG)	Uni Graz: 20
Excursions (EX)	30

§ 7. Guidelines for the allocation of places on courses

(1) If the number of students registered for a course exceeds the number of available places, parallel courses are to be provided. If necessary, these parallel courses may also be provided during the semester break.

(2) If it is not possible to offer a sufficient number of parallel courses (groups), the students are to be admitted to the course according to the following priority ranking:

a. Students who are required to complete the course according to their curriculum.
b. The sum of the successfully completed courses of the respective study programme (total ECTS credit points).
c. The date (earlier date takes priority) of the fulfilment of the participation requirement
d. Students who have already been placed on a waiting list or who must repeat the course are to be given priority on the next course.
e. The grade of the examination or the average grade of the examinations (weighted on the basis of the ECTS credit points) of the respective course(s) that are specified as the participation requirement.
f. Students who do not need to complete such courses in order to fulfil their curriculum are only considered based on the number of free places. It is possible to be included on a separate waiting list. The abovementioned provisions shall apply accordingly.

(3) 10% of the maximjm slots at each course are available for students who take a part of their studies at the universities participating in NAWI Graz in the context of mobility programmes.

III Course content and curriculum

§ 8. Modules, courses and semester allocation

The individual courses of this master's degree programme and their allocation to the compulsory and elective modules are indicated hereinafter. The competences, methods and skills provided in the modules are described in more detail in Annex I. The semester allocation is a recommendation and ensures that the sequence of courses builds optimally on prior aquired competences and considers workloads not exceeding 60 ECTS credit points within an academic year. Annex II and § 9 list the allocation of courses to the participating universities.

Master Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET)								
Module	**course (LV)**	**SSt**	**LV-type**	**ECTS**	**Semester, ECTS I**	**II**	**III**	**IV**
Obligatory Module A: Interdisciplinary Practice								
A.1	IP - Interdisciplinary Practical Training	6	AG	10			10	
subtotal		6		10	0	0	10	0

Master Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET)								
Module	**course (LV)**	**SSt**	**LV-type**	**ECTS**	**Semester, ECTS**			
					I	**II**	**III**	**IV**
Obligatory Module B: System Sciences								
B.1	Data in System Sciences	2	VO	3	3			
B.2	Systems-Modelling and Systems-Analysis	2	VO	3		3		
	B.3 oder B4							
B.3	Data in System Sciences	2	SE	4			4	
B.4	Systems-Modelling and Systems-Analysis	2	SE	4			4	
subtotal		6		10	3	3	4	0
Obligatory Module C: Climate and Environment								
C.1	Earth Climate System and Climate Change	2	VO	3	3			
C.2	Environmental Analytics	1.33	VO	2	2			
C.3	Environmental Physics & Energy	2	VO	2	2			
C.4	Environmental Records from Modern to Past	1.33	VO	2	2			
C.5	Raw Material Sciences	1.33	VO	2	2			
subtotal		8		11	11	0	0	0
Obligatory Module D: Applied Clean Technology								
D.1	Lab course on Clean Technology	6	LU	6		6		
D.2	Workshop / Seminar to Lab course on Clean Technology	1	SE	1		1		
D.3	Field Trip Clean Technology	1	EX	1		1		
subtotal		8		8	0	8	0	0
Obligatory Module E: Ecological Process Design								
E.1	Ecological Process Evaluation	2	VO	3	3			
E.2	Sustainable Process Technology	2	VO	3	3			
E.3	Introduction into Process Simulation and Process Design	1	VO	2		2		
E.4	Introduction into Process Simulation and Process Design	2	UE	2		2		
subtotal		7		10	6	4	0	0

Master Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET)								
Module	**course (LV)**	**SSt**	**LV-type**	**ECTS**	**Semester, ECTS I**	**II**	**III**	**IV**
Obligatory Module F: Environmental Management and Legal Basics								
F.1	Environmental Management	2	VO	3	3			
F.2	Environmental Legislation	1.33	VO	2		2		
F.3	Plant and Process Approval	2	VO	3		3		
subtotal		5.33		8	3	5	0	0
Obligatory Module G: REACH								
G.1	REACH - Registration, Evaluation, Authorisation and restriction of CHemical substances	2	VO	3		3		
G.2	Workshop / Seminar REACH	2	SE	2		2		
subtotal		4		5	0	5	0	0
Environmentally oriented Elective Subject H acc. §9								
	one of the modules H.1 - H.4 must be selected							
H.1	Climate and Climate Change			18				
H.2	Environmental Cycles in Hydro- and Lithosphere			18				
H.3	Environmental and Energy Technology			18				
H.4	Individually composed Module			18				
subtotal				18	4	4	7	3
I Master Seminar and Master Exam								
I.1	Master Seminar	2	SE	2				2
I.2	Master Exam			1				1
subtotal		2		3	0	0	0	3
J Master Thesis				30	0	0	8	22
K Free Electives acc. §10				7	3	1	1	2
overall				**120**	**30**	**30**	**30**	**30**

§ 9. Elective modules: Catalogues of courses

For the elective module 'H.1 Climate and Climate Change', courses with a total workload of 18 ECTS credit points must be completed from the following catalogue of courses.

Elective Module H.1 Climate and Climate Change								
18 ECTS credit points must be selected from the course list [(*) compulsory]								
		SSt	**LV type**	**ECTS**	**Uni Graz[1]**	**TU Graz[1]**	**WS**	**SS**
H.1.1	(*) Atmospheric Dynamics	2	VO	3	x			x
H.1.2	(*) Climate Dynamics	2	VO	3	x			x
H.1.3	(*) Paleoclimatology	2	VO	3	x		x	
H.1.4	Climate Modelling	2	VO	3	x		x	
H.1.5	Climate and Environmental Change - Current Research Topics	2	SE	3	x			x
H.1.6	Selected Topics in Climate Science	2	VO	3	x		x	
H.1.7	Selected Topics in Atmospheric and Climate Physics	2	SE	3	x			x
H.1.8	Applications in Environmental Economics	2	VU	6	x			x
H.1.9	Climate Economics and Climate Justice	2	VU	3	x			x
H.1.10	Special Topics in ESS / CCET - Climate and Climate Change	each 1		eq. 1.5	x	x	x	x
				18 ECTS credit points must be selected				

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

Courses entitled "H.1.10 Special Topics in ESS / CCET" are assigned to the elective module H.1 Climate and Climate Change, for which one semester hour generally corresponds to 1.5 ETCS credit points.

These courses are offered with descriptive subtitles for 1 or more semester hours for VO, SE or UE courses.

Courses with different subtitles shall be classified as different courses.

For the elective module 'H.2 Environmental Cycles in Hydro- and Lithosphere', courses with a total workload of 18 ECTS credit points must be completed from the following catalogue of courses.

Elective Module H.2 Environmental Cycles in Hydro- and Lithosphere								
18 ECTS credit points must be selected from the course list [(*) compulsory]								
		SSt	**LV type**	**ECTS**	**Uni Graz[1]**	**TU Graz[1]**	**WS**	**SS**
H.2.1	(*) Geodynamics of the Lithosphere	2	VO	3	x		x	
H.2.2	(*) Mineralogy and Aqueous Geochemistry	2	VO	3		x	x	
H.2.3	(*) Clay Mineralogy	1.33	VO	2		x	x	
H.2.4	(*) Biosphere's Role in Earth Systems	2	VO	3	x		x	
H.2.5	Geothermal Energy	1.33	VO	2		x		x
H.2.6	Environmental Isotope Proxies	1.50	VU	2		x	x	
H.2.7	Tectonics	2	VO	3	x		x	
H.2.8	Subsurface Flow and Transport Processes	2	VU	3	x		x	
H.2.9	Hydrogeochemical Modelling	2	UE	2		x		x
H.2.10	Groundwater Modelling	2	KS	2	x			x
H.2.11	Aqueous Geochemistry - Practical Field Course	2	EX	2		x		x
H.2.12	Industrial Minerals	2	EX	2		x		x
H.2.13	Special Topics in ESS / CCET- Environmental Cycles in Hydro- and Lithosphere	each 1		eq. 1.5	x	x	x	x
				18 ECTS credit points must be selected				

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

Courses entitled "H.1.10 Special Topics in ESS / CCET" are assigned to the elective module H.2 Environmental Cycles in Hydro- and Lithosphere, for which one semester hour generally corresponds to 1.5 ETCS credit points.

These courses are offered with descriptive subtitles for 1 or more semester hours for VO, SE or UE courses.

Courses with different subtitles shall be classified as different courses.

For the elective module 'H.3 Environmental and Energy Technology', courses with a total workload of 18 ECTS credit points must be completed from the following catalogue of courses.

Elective Module H.3 Environmental and Energy Technology								
18 ECTS credit points must be selected from the course list [(*) compulsory]								
		SSt	**LV type**	**ECTS**	**Uni Graz[1]**	**TU Graz[1]**	**WS**	**SS**
H.3.1	(*) Environmental Technologies	3	VO	4		x	x	
H.3.2	(*) Energy Storage and Conversion	1.33	VO	2		x		x
H.3.3	Project Laboratory (MAS.190_x, CHE.600 (RenRes), CHE.601 (MacroMol), CHE.603 (InorgMatElChem))	8	LU	6	x	x	x	x
H.3.4	Functional Materials I	2	VO	3		x		x
H.3.5	Renewable Resources: Chemistry and Technology I	1.33	VO	2	x	x		x
H.3.6	Introduction to Material Science	2	VO	3		x	x	
H.3.7	Batteries and Supercapacitors	3	VO	4		x		x
H.3.8	Ecological Process Evaluation	2	VU	3		x	x	
H.3.9	Fuel Cells and Energy Storage	2	VO	3		x		x
H.3.10	Energy Systems Analysis	2	VO	3		x		x
H.3.11	Special Topics in ESS / CCET - Environmental and Energy Technolgy	each 1		eq. 1.5	x	x	x	x
				18 ECTS credit points must be selected				

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

Courses entitled "H.1.10 Special Topics in ESS / CCET" are assigned to the elective module H.3 Environmental and Energy Technology, for which one semester hour generally corresponds to 1.5 ETCS credit points.

These courses are offered with descriptive subtitles for 1 or more semester hours for VO, SE or UE courses.

Courses with different subtitles shall be classified as different courses.

Elective Module H.4 Individually composed module

For the choice module 'H.4 Individually composed module', a list of courses with a workload of 18 ECTS credit points are to be composed and completed individually according to the following criteria:

a) The elective subject comprises a subject related to environmentally relevant aspects.
b) This environmentally relevant subject will be completed by master-level courses which provide a deep-going insight to the selected topic.
c) These courses may be completed at any recognised post-secondary level domestic or foreign institution (typically an university).
d) The environmentally relevant subject comes with a clear title which will be listed as the module header in the master's degree certificate, a list of coures covering a minimum of 18 ECTS or equivalent credits, and a conclusive declaration of aquired competences.
e) Admission / acceptance of an 'Individually composed module' must be applied in advance at the authority in charge fro the Study Programme.

§ 10. Free-choice subject

(1) The courses to be completed as part of the free-choice subject in the master's degree programme in ESS / CCET are designed to provide individual emphasis and further development of the students. They can be freely selected from the courses offered by any recognised Austrian or foreign universities, as well as any Austrian universities of applied sciences and university colleges for education. Annex III contains recommendations for free-choice courses.

(2) If no ECTS credit points are assigned to a free-choice course, one ECTS credit point is awarded for every semester hour (SSgt.) of this course. If such courses are lecture-type courses (VO), they are assigned 1.5 ECTS credit points for each semester hour.

(3) Students also have the possibility of completing a vocational internship or short study periods abroad as part of the free-choice subject pursuant to § 13.

§ 11. Master's thesis

(1) The master's thesis is proof of the student's capability to perform scientific research independently and with academic grounding as far as content and methodology are concerned. The scope of work of the master's thesis must be chosen in such as way as to enable students to finish their thesis within a period of six months.

(2) The topic of the master's thesis must be taken from one of the compulsory or elective modules. The authority in charge for the Study Programme shall decide on exceptions.

(3) Before a student starts work on their master's thesis, it must be registered via the responsible dean's office with the involvement of the authority in charge for the Study Programme. The topic, the area of expertise of the topic and the supervisor as well as the institute must be stated.

(4) 30 ECTS credit points are awarded for the master's thesis.

(5) The master's thesis is to be submitted for evaluation in printed and in electronic form.

§ 12. Registration requirements for courses/examinations

Requirements listed below are highly recommended to be completed to meet the level of listed Courses (LV).

Course (LV)	Requirements
B.3 Data in System Sciences (SE)	Prior completed lectures (VO) 'B.1 Data in System Sciences' and 'B.2 Systems-Modelling and Systems-Analysis' are highly recommended.
B.4 Systems-Modelling and Systems-Analysis (SE)	Prior completed lectures (VO) 'B.1 Data in System Sciences' and 'B.2 Systems-Modelling and Systems-Analysis' are highly recommended.
H.3.3 Project Laboratory (LU)	Prior completed Laboratory course (LU) 'D.1 Lab course on Clean Technology' and the prallel seminar (SE) to the Laboratory course 'D.2 Workshop / Seminar to Lab course on Clean Technology' is highly recommended.

Admission to the master's degree examination before a committee requires proof of the positive assessment of all examination results according to §§ 8 to 9 above as well as proof of the positive assessment of the master's thesis.

§ 13 Study periods abroad and internship

(1) Recommended studies abroad

Students are encouraged to complete parts of their programme abroad. Modules and courses completed during studies abroad are subject of recognition to be argued with respect to equivalences in applications to the authority in charge for the Study Programme. Students are referred to § 78 para. 5 UG (prenotification) for the recognition of examinations during studies abroad

Additionally, short study period or officially announced summer or winter schools may be argued in applications to the authority in charge for the Study Programme for recognition for free-choice subject ECTS.

(2) Internship

Students are encouraged to complete a vocational internship as part of the free-choice subject. In this context, every working week in full-time employment shall correspond to 1.5 ECTS credit points. Active participation in a scientific event is accepted as an internship.In gneral, internships are supposed as meaningful additions to the degree progamme. Internships are to be applied and argued for recognition at the authority in charge for the Study Programme.

IV Examination regulations and degree certificate

§ 14. Examination regulations

Courses are evaluated individually.

(1) Examinations for courses held as lectures (VO) cover the complete content of the course. Examinations are held exclusively orally, exclusively in writing, or in writing and orally as a combination.

(2) For courses held as lectures with integrated exercises (VU), exercises (UE), laboratory courses (LU), working groups (AG), seminars (SE), classes (KS) and excursions (EX), a student's performance is assessed continually on the basis of that student's contributions and/or through accompanying tests. The assessment must always consist of at least two examinations.

(3) Examinations with positive results are to be assessed as "very good" (1), "good" (2), "satisfactory" (3) or "sufficient" (4); those with negative results are to be assessed as "insufficient" (5).

(4) If a module includes separate examinations for the relevant courses, the overall module grade is to be determined by:

a. multiplying the grade of each examination result in connection with the module with the ECTS credit points of the corresponding course;
b. adding the values calculated according to lit. a.;
c. dividing the result of the addition by the sum of the ECTS credit points of the courses, and
d. rounding the result of the division to a whole-numbered grade if required. The grade must be rounded up if the decimal place exceeds 0.5. Otherwise, the grade must be rounded down.
e. A positive module grade can only be awarded if every individual examination result is positively assessed.
f. Courses which are assessed exclusively by successful/unsuccessful participation shall not be included in this calculation according to lit. a. to d.

(5) The master's degree examination before a committee consists of:

- the presentation of the master's thesis (maximum duration 20 minutes);
- the defence of the master's thesis (oral examination);

- an oral examination covering topics from the module to which the master's thesis is assigned, as well as topics from one other module pursuant to § 8.

The topics are determined by the authority in charge for the Study Programme of the university to which the student is admitted on a proposal by the candidate. The total duration of the master's degree examination before a committee is generally 60 minutes and must not exceed 75 minutes.

(6) The master's examination senate consists of the supervisor of the master's thesis and two further members nominated by the authority in charge for the Study Programme after hearing the candidate's suggestion. The senate is chaired by a member of the examination senate who is not the supervisor of the master's thesis.

(7) The grade of the examination before a committee is determined by the examination senate.

(8) In order to assist students in completing their degrees in a timely manner, courses with continual assessment must allow students to submit, supplement or repeat partial course requirements, in any case at least one partial course requirement to be determined by the course director, by no later than four weeks after the course has ended. If the registration period for a key course ends within this time frame, this possibility must be extended until the end of the registration period. Laboratory courses are excluded from this regulation.

(9) For registration and deregistration as well as for holding examinations, the provisions of the statute of each university tasked with holding the relevant examination shall apply. If an examination is held jointly by both universities, information shall be published in the online system on which statute will apply. The regulations shall apply for lectures (selective examination) and for courses with continual assessment.

§ 15. Degree certificate

(1) The master's degree programme is completed by attaining a positive assessment of the courses of all the compulsory and elective modules, the free-choice subject, the master's thesis and the master's degree examination before a committee.

(2) A degree certificate shall be issued for successful completion of the degree programme. The degree certificate for the master's degree programme in ESS / CCET contains

a. a list of all modules (examination subjects) according to § 4 (including the ECTS credit points) and their assessments;

b. the title and the assessment of the master's thesis;

c. the assessment of the final examination before a committee;

d. the entirety of the ECTS credit points for the free-choice subject according to § 10 above, and

e. the overall assessment of the degree programme

The overall assessment of the degree programme shall be deemed as "passed" if each module as well as the master's thesis and the master's degree examination before a committee have been positively assessed. This overall assessment of the degree programme shall be deemed as "passed with distinction" if neither a single module nor the master's thesis and the master's degree examination before a committee have been given a grade lower than "good;" and at least half of the assessments (modules, master's thesis, master's degree examination before a committee) have been given a grade of "very good."

V Legal validity and transitional provisions

§ 16. Legal validity

This curriculum 2018 (UNIGRAZ abbreviation 18W, TUGRAZonline abbreviation 18U) shall come into effect on October 1st, 2018.

§ 17. Transitional provisions

When this curriculum comes into effect on October 1st, 2018, students of the master's degree programme in ESS / CCET (curriculum 2012) shall be entitled to complete their degree programme within 6 semesters according to the provisions of the curriculum 2012. If the degree programme is not completed by 30 September 2021, students will be subject to the curriculum for the master's degree programme in ESS / CCET as amended. Students are entitled to voluntarily opt for the new curriculum at any time within the admission periods. To this end, a written irrevocable declaration must be submitted to the authority in charge for the Study Programme.

Annex to the curriculum for the master's degree programme in Environmental System Sciences / Climate Change and Environmental Technology (ESS / CCET).

Annex I.

Module descriptions

Compulsory module A	Interdisciplinary Practice
ECTS credit points	10
Subject content	• project development / project transfer • project takeover. problem analysis, project planning • guided project implementation in teams • argumentation of compiled strategies and options for action • comprehensive documentation and communication of results • evaluation of the implementation of the project • Subsequent project development on the basis of obtained results
Learning outcomes	Students, upon completion of the module, will be able • to develop a project from a general evidence base and to transfer this project • to take over an extensive project plan, to make a systematic problem analysis and plan the execution • to develop methods and action proposals on subareas of the project plan in teams • to argue compiled strategies and action proposals • to document compiled strategies and action proposals • to communicate comprehensive results of the project realisation • to evaluate project execution • to carry out project development from the achieved results
Teaching and learning activities and methods	• assumption of a comprehensive project assignment • introductory presentations of problems and solutions • group work on problem areas in the context of the project plan • writing a report or manuscript according to scientific criteria • summary of team results • (continued) project preparation from the achieved results • evaluation of project implementation
expected prior knowledge	• project planning • project management • methods for project analysis • development of strategies and action and solution approaches • simulation techniques • scientific writing • evaluation methods
Frequency with which the module is offered	every semester

Compulsory module B	System sciences
ECTS credit points	10
Subject content	• conceptional, mathematical and computer-based system modelling • data extraction, integration and analysis • model and system evaluation

	• conceptional, mathematical and computer-based analysis • resilience and sustainability of systems
Learning outcomes	Students, upon completion of the module, will be able • to understand and distinguish the added value and the limits of conceptional, mathematical and computer-based system modelling • to design and implement computer-based models of natural, physical and social systems • to extract appropriate data and integrate them into the models • to evaluate the models using statistical analysis • To retrieve and assess statements on the resilience and sustainability of the systems from the model evaluation • to present these statements in a scientifically correct manner in both orally and in writing • to design additional independent research
Teaching and learning activities and methods	• Presentation • collaboration in data analysis and model building • introductory presentations of problems and solutions • group work in problem areas, • writing reports or manuscripts according to scientific criteria • summary of team results • evaluation
expected prior knowledge	• content of the BA courses USW-Computational Basics, Systemwissenschaften 1 and Angewandte Systemwissenschaften • an understanding of the methodical characteristics of system sciences • experience with computer-based modelling (knowledge in of e.g.: Python, R, Matlab, Mathematica…)
Frequency with which the module is offered	Every academic year

Compulsory module C	**Climate and Environment**
ECTS credit points	11
Subject content	• The climate system that is earth (fundamental ideas, components, phenomenology, budget, cycles, budgetary principle); palaeoclimate and climatic history; climatic observation, climatic classification and network & field modelling concepts; climatic-physical mechanisms and geobiochemical cycles; energy balance of the earth and anthropogenic imbalance; climatic modelling, climatic forecast and climatic scenarios; humans and climate in times of change; physical climate change as a challenge for economics and society (climate protection, climate change adjustment, losses & damages) • Modern methods of chemical analytics (sampling, process analytics, remote sensing) with emphasis on analytic chemistry, optical spectroscopy (IR, VIS, UV) and electron spectroscopy in the vacuum • Modern methods of physical analytics with emphasis on particle measuring technology, atomic absorption spectrometry, FTIR & Raman spectroscopy, auger electron and photoelectron spectroscopy, X-raying and fluorescence spectroscopy • Energy and physical mechanisms for sustainable environmental technologies: Radiation and energy conversion

	• Systematics in mineralogy; formation, properties and use inorganic materials, including raw materials; investigation of environmental and climate indicators with modern geochemical forensics and palaeoreconstruction with the application of stable isotopes with regard to element signatures and microstructural development in terrestrial, marine and technical environments.
Learning outcomes	Students, upon completion of the module, will be able • to estimate the scope of environmental-physical climatology and the climate sciences and to apply them in substantial parts • to assess and argue natural and anthropogenic contributions to climate change and climate variability • to recognise and assess the effects of climatic change in economics and society • to estimate the performance profile of modern physical and chemical research methods • to understand problems from radiation and energy conversion • to independently develop physical and chemical analytic questions, design carefully targeted analytic strategies, select suitable methods and techniques and assess analytic results • to deal with the systematics of mineralogy and understand the and the possibilities for utilising inorganic raw materials • to assess the spectrum of geochemical investigation techniques for terrestrial, marine and technical environments ranging from forensic analysis techniques to palaeoreconstructions
Teaching and learning activities and methods	• Presentation • Lecture notes and materials • Illustrative material and discussion
expected prior knowledge	• Basic knowledge in analytic chemistry (organic analytics, inorganic analytics and trace element analytics) as well as chemistry laboratory experience • Basic knowledge in atomic and molecule physics; the laws of radiation and physics laboratory experience
Frequency with which the module is offered	Every academic year

Compulsory module D	**Applied Clean Technology**
ECTS credit points	8
Subject content	• Project-oriented, experimental tasks in physical, chemical and process-technology-based laboratories to selected tasks from the field of environmental analytics, process control, earth sciences, material and energy engineering • IT-supported access to the modelling of physical and chemical influences on the environment and climate as well as associated preventive measures • software-supported management and logistics of the use of various resources and related aspects of sustainability • supervised independent co-ordination and planning of practical tasks • collection of data with different analytic techniques, processing and preparation of collected data, writing reports on individual tasks; connecting obtained results with data from literature and critically evaluating the results and methods in view of the intended goal; estimation of the accuracy and soundness of obtained results • presentation of a special aspect from the spectrum of the investigations carried out in the context of a poster presentation and discussion

	• writing a manuscript according to scientific criteria with regard to aspects of the sustainability of the work carried out • inspecting commercial and industrial of businesses and companies with follow-up either in writing or as a presentation and a critical discussion of selected aspects
Learning outcomes	Students, upon completion of the module, will be able • to assess the possibilities of physical and chemical laboratory analysis techniques in general and to evaluate certain techniques in more detail on the basis of practical experience • to understand both small- and large-scale physical and chemical influences on the environment and the climate • to identify analytical issues in complex tasks • to develop strategies for tackling of complex tasks with laboratory-based analytical contributions • to understand the idea of the fundamental scope of different techniques and the accuracy of data gathered, and to distinguish between technical limits and legally defined limits • to write reports on individual laboratory activities and to write a summarising manuscript on the basis of different project-oriented experiments according to scientific criteria on a given general topic • to prepare a specific aspect from the spectrum of practical work for a focused presentation and discussion • to critically evaluate and discuss selected aspects of commercial and industrial solutions
Teaching and learning activities and methods	• introductory class • practical exercises in physics and chemistry laboratories • computer-assisted tasks • supervised organisation and planning in teams • creating laboratory reports • presentation and discussion • scientific writing • visiting commercial and industrial units with subsequent evaluation of selected aspects
expected prior knowledge	• laboratory experience in chemistry and/or physics • the basics of chemical analytics and spectroscopy • experience with electronic data processing • the basics of project management • scientific writing
Frequency with which the module is offered	Every academic year

Compulsory module E	**Ecological Process Design**
ECTS credit points	10
Subject content	• introduction to the performance profile of 'processes' and 'evaluation'; basics of ecological evaluation of procedural processes, products and services • structuring ecological process reviews; classification of evaluation methods; details of selected evaluation methods, relevant standards (ISO, 1900x, EIA guidelines) • principles of green chemistry; solvent management, security management • basics of IT-supported design of chemical plants • configuration and function of the simulation software ASPEN: production of flow sheets, material and energy balances; selection and examination of material values and calculation methods; thermal, mechanical and chemical unit operations.
Learning outcomes	Students, upon completion of the module, will be able

	• to understand and apply methods of ecological process evaluation • to estimate the performance profile and the area of application of different evaluation methods • to evaluate technological processes in terms of aspects of sustainability • to assess the relevance of modern biotechnology for ecological processing • to assess the potential and limitations of information and communication technologies when designing of chemical plants and their operation
Teaching and learning activities and methods	• Presentation • Lecture notes and materials • Illustrative material and discussion • group work, presentation, discussion
expected prior knowledge	• basic knowledge of chemistry • basic knowledge of biotechnology • basic knowledge of process engineering • thermodynamics
Frequency with which the module is offered	Every academic year

Compulsory module F	**Environmental Management and Legal Basics**
ECTS credit points	8
Subject content	• Environmental management: environment and general conditions (technically, economically, ecologically, sociologically, legally) • programmes, 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, emission trade) • basics of the environmental law, development, structure, implementation and enforcement of EU and Austrian environmental legislation • handling legal databases • introduction to handling industrial permitting procedures: co-operation of technicians with the licensing authority
Learning outcomes	Students, upon completion of the module, will • know the principles and framework of Austrian, EU and international environmental management systems • have a basic knowledge in the area of environmental law, know about the structure and dynamics of environmental legislation and be familiar with the possibilities of legal databases • know how to prepare a plant or process project so that all relevant factual content can be taken over by lawyers of a licensing authority
Teaching and learning activities and methods	• Presentation • Lecture notes and materials • Illustrative material and discussion
expected prior knowledge	• established ideas about the qualification profile of the degree programme as a basis for the application of the content taught • Project management and execution
Frequency with which the module is offered	Every academic year

Compulsory module G	REACH
ECTS credit points	5
Subject content	• principles, structure and objectives of REACH; the REACH procedure: registration, evaluation, authorisation and restriction of substances; chemical safety assessment and chemical safety report • legal framework for chemicals in the EU; tasks of the European Chemicals Agency (ECHA) • the REACH procedure in practice: case studies
Learning outcomes	Students, upon completion of the module, will • understand the REACH concept • be familiar with the safety checks and regulations when dealing with chemical compounds in the EU • know the mission statement and the tasks of the European Chemicals Agency (ECHA)? • have got to know the practice of REACH in selected case studies
Teaching and learning activities and methods	• presentation • lecture notes and materials • presentation and discussion • scientific writing
expected prior knowledge	• basic knowledge of chemistry, biology and ecology • basic knowledge of process engineering • basics of environmental legislation
Frequency with which the module is offered	Every academic year

Elective module H.1	Climate and Climate Change
ECTS credit points	18
Subject content	compulsory: • atmospheric thermodynamics; equations of motion; atmospheric rivers; scale analysis; atmospheric waves; weather systems, air masses and weather fronts • geophysical fluid dynamics; energy balance models; climatic equilibrium and stability; large-scale climatic modes; climatic variability • historical climatic and environmental technology optional: • hierarchy of climate models; parameterisation; climate model experiments; model skills; climate projections; regional climate modelling • current research issues and debates in the field of climate and environmental change with subjects ranging from physical climate research and climate impact research to climate protection and issues of climate damage and losses • fundamental processes in the atmosphere and the climate system • current research in the atmosphere and climatic physics • current state of knowledge regarding climatic observation and climatic projections • application-orientated discussion of current questions from the environmental economics, like climate protection, foreign trade and environment, sustainability and growth • evaluation of the impact of different environmental policies and their limits

Learning outcomes	Students, upon completion of the module, will • understand the basic physics of atmospheric thermodynamics and atmospheric movements and rivers • be able to apply scale analysis in order to simplify equations of motion • be able to draw upon methods of perturbation theory for the analysis of atmospheric waves • be able to interpret the influence of large-scale climatic modes • be able to use methods of fluid dynamics in the process analysis • be able to contribute to the discourse concerning the causes and consequences of climate change with consideration of historical climate changes • have delved into one or more of the following topics: basics of the climatic modelling; critical interpretation of the design of model simulations and their results; communication and discussion of current aspects of the climatic and environmental change on a global and regional scale; physical climatic research, effects, adjustment, vulnerability, climate protection, losses & damage due to climate change; to conduct analyses for a concrete environmental problem (climate change, shortage of fossil raw materials,…); to develop solutions (environmental policies) and to judge them with regard to their effectiveness and limits
Teaching and learning activities and methods	• lectures, seminars, and presentation • group work in problem areas, • summary of (team) results
expected prior knowledge	• basics of meteorology and climatology
Frequency with which the module is offered	Every academic year

Elective module H.2	**Environmental Cycles in Hydro- and Lithosphere**
ECTS credit points	18
Subject content	compulsory: • geodynamics of the lithosphere (e.g. orogeny) • reactions and element cycles in the dissolution and reformation of minerals in natural and anthropogenic surroundings • influence of fluid-dynamic and biological factors on element cycles on the earth's surface optional: • development of geothermal energy and deep groundwater circulation • software-supported modelling and interpretation of aquatic environments • use of element signatures and stable isotopes as indicators for the reconstruction and/or the monitoring of environmental conditions and (palaeo-)climate • hydrogeochemical field trips: sampling, modern laboratory analyses, interpretation and communication of collected data • industry excursion
Learning outcomes	Students, upon completion of the module, will • be able to assess and interpret analytic data on processes of the hydrosphere and lithosphere • be able to evaluate the influence of biogenic factors on global element cycles • be able to plan and carry out geological/geochemical case studies in relation to the extent of natural and anthropogenic influences • have delved into one or more of the following topics: geothermal energy; the use of isotopes and trace elements in order to track

	geochemical processes; modelling and interpretation of geological surroundings; reconstruction of contamination mechanisms of aquatic systems; sampling, modern laboratory analyses and communication of collected data; insight into the mineral industry;
Teaching and learning activities and methods	• presentation • lecture notes and materials • Development and execution of project plans • Illustrative material and discussion • practical exercises in analytic laboratories • computer-assisted tasks • computer-supported tasks • interaction between data analysis and model development • presentation and argumentation of proposed methods, solutions and achieved results • writing reports/scientific papers
expected prior knowledge	• basic knowledge of chemistry, physics and mathematics • basic knowledge of programming and the use of algorithms
Frequency with which the module is offered	Every academic year

Elective module H.3	**Environmental and Energy Technology**
ECTS credit points	18
Subject content	compulsory: • cycles in technological production processes • masses and energy balances in general, pollutant balances and balances on CO_2, NO_x, etc. in particular • calculation of waste water and exhaust air treatment plants • recycling processes for plastics and metalliferous waste • structure of energy production; renewable/fossil energy sources; • primary energy (sun, wind, water, ambient heat, terrestrial heat, biomass), secondary energy (electricity, heat, alternative fuels) • sustainable energy storage (electro-chemical, chemical, electromagnetic, mechanic, thermal) • energy conversion technologies (fuel cell/electrolyser, internal combustion engines, generator, Stirling engine, heat pumps) • Energy systems and efficiency chains optional: • six-week team training with selected aspects from physical and chemical research with state-of-the-art equipment in physics and chemistry laboratories • electroceramics, superconductors, batteries, gas cells and possibilities of hydrogen storage • carbon-based raw materials from the earth's ecosystem; concepts of biorefinery and green chemistry; technologies for the processing and transformation of biogenic materials • microstructure of metallic materials; parameters and thermodynamics of crystals; steel: production, alloys, characteristics, testing methods • fuel cell technology: thermodynamics and electrochemistry; fuel cell systems; application of fuel cells in: portable appliances, vehicles and power plants; the polymer electrolyte fuel cell (PEFC) • development of global energy systems; analysis of determinant parameters in energy supply and consumption; global and local perspectives and scenarios of energy supply

	• normative basics of the ecological assessment of different LCA elements; application of LCA principles to processes; case studies; LCA-ISO standard structure and elements; rules for eco-inventory and allocation
Learning outcomes	Students, upon completion of the module, will • understand the cycles in technological production processes • be able to deal with mass and energy balances of technological processes generally and with pollutant balances in particular • understand calculations for waste water and exhaust air treatment in the field of technological processes • be familiar with recycling processes for plastics and metalliferous waste • be familiar with the primary and secondary power supply options • know about the most important energy transformation technologies; • be able to estimate the performance profile of different energy storage technologies • have delved into one or more of the following topics: six-week practical experience in physics and chemistry laboratories during guided team work on selected aspects of current research questions; batteries, fuel cells, electroceramics; metallic compounds, steel and steel alloys; carbon-based raw materials, differently scaled biorefineries and processing technologies for biogenic raw materials; development and perspective of global energy systems; ecological LCA process evaluation
Teaching and learning activities and methods	• presentation • lecture notes and materials • Illustrative material and discussion • practical exercises in physics and chemistry laboratories • computer-assisted tasks • supervised organisation and planning in teams • creating laboratory reports • presentation and discussion • scientific writing
expected prior knowledge	• experience with working methods and knowledge of safety regulations in chemistry and physics laboratories • basic knowledge of inorganic chemistry • basic knowledge of electrochemistry • basic knowledge of physical chemistry and molecular spectroscopy • basic knowledge of macromolecular chemistry and solid-state physics • basic knowledge of energy systems
Frequency with which the module is offered	Every academic year

Annex II.

Study schedule

1.Semester		SSt	type	ECTS	Uni Graz[1]	TU Graz[1]
B.1	Data in System Sciences	2	VO	3	x	
C.1	Earth Climate System and Climate Change	2	VO	3	x	
C.2	Environmental Analytics	1.33	VO	2	x	
C.3	Environmental Physics & Energy	2	VO	2	x	
C.4	Environmental Records from Modern to Past	1.33	VO	2	2	
C.5	Raw Material Sciences	1.33	VO	2	x	
E.1	Ecological Process Evaluation	2	VO	3		x
E.2	Sustainable Process Technology	2	VO	3		x
F.1	Environmental Management	2	VO	3		x
H	Environmentally oriented Subject acc.§9			4	x	x
K	Free Electives acc.§10			3	x	x
overall				30		

2.Semester		SSt	type	ECTS	Uni Graz[1]	TU Graz[1]
B.2	Systems-Modelling and Systems-Analysis	2	VO	3	x	
D.1	Labcourse on Clean Technology	6	LU	6	x	x
D.2	Workshop / Seminar to Labcourse on Clean Technology	1	SE	1	x	x
D.3	Field Trip Clean Technology	1	EX	1	x	x
E.3	Introduction into Process Simulation and Process Design	1	VO	2		x
E.4	Introduction into Process Simulation and Process Design	2	UE	2		x
F.2	Environmental Legislation	1.33	VO	2	x	
F.3	Plant and Process Approval	2	VO	3		x
G.1	REACH - Registration, Evaluation, Authorisation and restriction of CHemical substances	2	VO	3		x
G.2	Workshop / Seminar REACH	2	SE	2	x	
H	Environmentally oriented Subject acc. §9			4	x	x
K	Free Electives acc.§10			1	x	x
overall				30		

3.Semester		SSt	type	ECTS	Uni Graz[1]	TU Graz[1]
A.1	IP - Interdisciplinary Practical Training	6	AG	10	x	
B.3 oder B4	Data in System Sciences *oder* Systems-Modelling and Systems-Analysis	2	SE	4	x	
J	Master Thesis			8	x	x
H	Environmentally oriented Subject acc. §9			7	x	x
K	Free Electives acc.§10			1	x	x
3.Semester Summe				30		

4.Semester		SSt	type	ECTS	Uni G[1]	TU[1]
I.1	Master Seminar	2	SE	2	x	x
I.2	Master Exam			1	x	x
J	Master Thesis			22	x	x
H	Environmentally oriented Subject acc. §9			3	x	x
K	Free Electives acc.§10			2	x	x
overall				30		
overall				120		

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

Annex III.

Recommended courses for the free-choice subject

Free-choice courses can be freely chosen from the courses offered at any recognised Austrian and foreign universities, as well as any Austrian universities of applied sciences and university colleges for education according to § 10 of this curriculum.

In order to broaden students' basic knowledge in the modules of this degree programme, courses in foreign languages, social competence, technology assessment and women's and gender studies are recommended. In particular, we would like to refer students to the courses offered by the TU Graz service department Languages, Key Competencies and In-House Training or treffpunkt sprachen of the University of Graz, the Centre for Social Competence of the University of Graz as well as the Inter-University Research Centre for Technology, Work and Culture (IFZ).

In addition, we would like to refer to the courses offered by 'TIMEGATE - Business Administration for everyone!' at the Department of Corporate Leadership and Entrepreneurship of the University of Graz.

Annex IV.

Equivalence list

Courses for which the equivalence or recognition is defined in this part of the Annex to the curriculum do not require separate recognition by the authority in charge for the Study Programme. Individual recognition awarded by means of an official decision made by the authority in charge for the Study Programme according to § 78 UG is also possible.

An equivalence list defines the equivalence of successfully completed courses of this curriculum and of the previous curriculum. This equivalence applies in both directions, that is, successfully completed courses of the previous curriculum may be credited in this curriculum and successfully completed courses of this curriculum may be credited in the previous curriculum.

This curriculum, version 2018				**Previous curriculum, version 2012**			
Course	**Type**	**SSt.**	**ECTS**	**Course**	**Type**	**SSt.**	**ECTS**
A.1 IP - Interdisciplinary Practical Training	AG	6	10	A.1 IP - Interdisziplinäres Praktikum	AG	6	10
B.1 Data in System Sciences	VO	2	3	B.1 Systemintegration und Systembewertung	VO	2	3
B.2 Systems-Modelling and Systems-Analysis	VO	2	3	B.2 Systemmodellierung	VO	2	3
B.3 Data in System Sciences	SE	2	4	B.3 Seminar zu Systemintegration und Systembewertung	SE	2	4
B.4 Systems-Modelling and Systems-Analysis	SE	2	4	B.4 Seminar zu Systemmodellierung	SE	2	4
C.1 Earth Climate System and Climate Change	VO	2	3	C.4 Klimasystem der Erde und Klimawandel	VO	2	3
C.2 Environmental Analytics and C.3 Environmental Physics & Energy	VO VO	1.33 2	2 2	E.1 Umweltanalytik	VO	2.66	3
C.4 Environmental Records from Modern to Past	VO	1.33	2	No equivalent			
C.5 Raw Material Sciences	VO	1.33	2	C.2 Mineralische Rohstoffkunde	VO	1.33	2
D.1 Lab course on Clean Technology	LU	6	6	E.2 Laborübungen zu Umwelttechnik	LU	6	6
D.2 Workshop / Seminar to Lab course on Clean Technology	SE	1	1	E.3 Seminar zu den Laborübungen Umwelttechnik	SE	1	1
D.3 Field Trip Clean Technology	EX	1	1	No equivalent			
E.1 Ecological Process Evaluation	VO	2	3	C.3 Biodiversität und angewandte Mikobiologie	VO	2	3
E.2 Sustainable Process Technology	VO	2	3	F.8.10 Ökologische Prozesstechnik	VO	2	3
E.3 Introduction into Process Simulation and Process Design and	VO	1	2	C.1 Eigenschaften, Modifikation und Nutzung von Ressourcen	VO	2.66	4

This curriculum, version 2018				Previous curriculum, version 2012			
Course	**Type**	**SSt.**	**ECTS**	**Course**	**Type**	**SSt.**	**ECTS**
E.4 Introduction into Process Simulation and Process Design	UE	2	2				
F.1 Environmental Management	VO	2	3	D.1 Umweltmanagement	VO	2	3
F.2 Environmental Legislation	VO	1.33	2	D.3 Umweltgesetzgebung	VO	1.33	2
F.3 Plant and Process Approval	VO	2	3	F.8.7 Anlagengenehmigungsverfahren	VO	2	3
G.1 REACH - Registration, Evaluation, Authorisation and restriction of CHemical substances	VO	2	3	D.2 REACH – Registration, Evaluation, Authorisation and Restriction of Chemical substances	VO	2	3
G.2 Workshop / Seminar REACH	SE	2	2	F.8.1 Seminar REACH	SE	2	2
No equivalent				D.4 ArbeitnehmerInnenschutz	VO	1.33	2
H.1-4 Environmentally oriented Elective Subject acc. §9			18	F Umweltorientiertes Wahlfach / umweltorientierte Wahlfächer (gebundenes Wahlfach) lt §8			22
I.1 Master Seminar	SE	2	2	G.1 Masterseminar	SE	2	2
I.2 Master Exam			1	G.2 Masterprüfung			1
J Master Thesis			30	H Masterarbeit			30

Annex V.

Admission

(1) Pursuant to § 2 of this curriculum, graduates of the bachelor's degree programme in Environmental Systems Sciences / Natural Sciences-Technology shall be admitted to the master's degree programme without any further requirements.

(2) In addition, however, all previous studies with a workload of at least 120 ECTS credit points and in the field of environmental sciences, systems science, engineering or natural sciences, with at least 60 ECTS credit point in the subject of chemistry and/or physics and/or process engineering, shall be deemed to be 'eligible with regard to subject.'

(3) If a degree programme is eligible with regard to subject, and only certain supplementary qualifications are required for full equivalence with an admissible degree programme, additional courses and examinations of the bachelor's degree programme in Environmental Systems Sciences / Natural Sciences-Technology with a maximum scope of 30 ECTS credit points may be prescribed in order to obtain full equivalence. Recognition of these additional qualifications to be obtained is

permitted up to a maximum workload of 5 ECTS credit points for the free-choice subject pursuant to § 10.

(4) Graduates of the following bachelor's degree programmes offered as part of NAWI Graz may be admitted to the master's programme ESS / CCET with the condition that they complete the relevant courses listed from the NAWI Graz bachelor's degree programme in Environmental Systems Science / Natural Science Technology as part of their master's degree programme:

Bachelor Physics *and* **Bachelor Process Engineering**		ECTS	type	SSt
B.2.2 or B.2.3	Applied System Sciences 1 *or* Applied System Sciences 2	3	SE	2
overall		3		2

Bachelor Chemistry *and* **Bachelor Geosciences**		ECTS	type	SSt
C.1.3	ESS Computational Basics	2	VO	2
C.1.4	Exercises to ESS Computational Basics	1	UE	1
B.2.2 or B.2.3	Applied System Sciences 1 *or* Applied System Sciences 2	3	SE	2
overall		6		5

Annex VI.

Glossary

Glossary of the terms used, which are different in the statutes and guidelines of both universities

Term in this curriculum (NAWI Graz)	**Terms at Uni Graz**	**Terms at TU Graz**
SSt.	KStd. (Kontaktstunde)	SSt. (Semesterstunde)
Elective module	Gebundenes Wahlfach	Wahlfach
Free-choice subject	Freie Wahlfächer	Freifach