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Curriculum for the
Master's Programme in Environmental Engineering
Faculty of Engineering Sciences
University of Innsbruck

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§ 1 Categorization of programme

According to §54 para. 1 of the Universities Act of 2002, the Master's Programme in Environmental Engineering at the University of Innsbruck is grouped among the engineering sciences.

§ 2 Qualification profile

The degree awarded by this programme, the "Diplomingenieur" (diploma in engineering), is internationally comparable with a master's degree.

The Master's Programme in Environmental Engineering is closely related to the Master's Programme in Civil Engineering, also offered by the University of Innsbruck, and offers specialization in environmental engineering.

(1) Specialized skills

Environmental engineering encompasses a wide range of areas, such as residential water management, resource management, waste and disposal technology, spatial and environmental planning, traffic planning, traffic technology and traffic route engineering, geoinformatics and remote sensing, technical equipment in buildings, hydrology and hydraulic engineering, energy and ecoinformatics, environmental and process engineering. The Master's Programme in Environmental Engineering at the University of Innsbruck focuses on those areas of these disciplines that are strongly connected to civil engineering. As a result, graduates of the Master's Programme in Environmental Engineering at the University of Innsbruck possess the necessary knowledge, skills and abilities to develop solutions for technical tasks in environmental engineering, traffic systems, geotechnical engineering, hydraulic engineering, surveying and energy-efficient building. They are able to correctly apply their highly specialized knowledge, drawing on the latest findings from various areas of environmental engineering, to develop and implement innovative solutions and to engage in discourse with colleagues. Graduates possess the competence and critical awareness to independently realize socially and environmentally sustainable projects.

(2) Scientific training

Graduates are able to apply the scientific methods and findings of the engineering sciences. Moreover, they possess specialized problem-solving skills in research and innovation that allow them to acquire further knowledge, to develop new methods and to combine knowledge from various fields. Building on scientific principles and methods, students are trained in analytic and interdisciplinary thinking and in critical reflection.

As a result of the following skills, graduates are able to apply scientific methods and findings in the field and to acquire further knowledge independently:

- a) Advanced understanding of the interconnections and problems in the engineering sciences
- b) Professional competence in the application of fundamental knowledge in the core areas of the practical subjects
- c) The ability to develop solutions for complex engineering tasks independently
- d) The application of modern IT, management and presentation methods

The Master's Programme in Environmental Engineering qualifies students to pursue further advanced studies in engineering.

(3) Wide-ranging skills

Graduates possess problem-solving skills based on sound scientific theories and methods. They are familiar with the management of complex, unpredictable working contexts that require new strategic approaches. They possess wide-ranging skills such as teamwork abilities and the capacity to work in interdisciplinary contexts. As a result of the diverse foreign language resources of the University of Innsbruck, funded stays abroad during the degree programme, and the incorporation of technical literature in English for certain master's programme courses, graduates also possess foreign language skills, an area that has become increasingly important. The required subject-specific internship, an essential part of the curriculum, provides practical skills that help graduates enter the workforce. Graduates understand the extensive interconnections between environmental engineering and the natural sciences, economics and law. They are able to use this knowledge to solve problems and to take on leadership positions in interdisciplinary projects.

(4) Professional prospects

Graduates of this environmental engineering programme are capable of working in planning, building and operations contexts for companies of various sizes and in capacities involving planning, projection, analysis, advising and implementation. They can also pursue professional activities at construction companies, public agencies and organizations, interest groups, media and at teaching and research institutions.

(5) Consecutive degree structure

The Master's Programme in Environmental Engineering provides in-depth, pre-professional training for students who have completed a bachelor's degree in a relevant field, e.g. the Bachelor's Programme in Civil and Environmental Engineering at the University of Innsbruck. Graduates are able to pursue further academic training.

§ 3 Scope and duration

The Master's Programme in Environmental Engineering covers 120 ECTS credit points (henceforth "ECTS-Credits"); this corresponds to a duration of four semesters. One ECTS-Credit is equivalent to a work-load of 25 hours.

§ 4 Admission

- (1) Admission to the Master's Programme in Environmental Engineering requires a completed bachelor's degree in an appropriate subject or completion of a comparable programme of study in an appropriate subject at a recognized national or international post-secondary educational institution.
- (2) The completed Bachelor's Programme in Civil and Environmental Engineering at the University of Innsbruck is always sufficient for this purpose. In accordance with the provisions of the Universities Act, the Rectorate is responsible for determining whether a given programme of study from an Austrian or international institution is considered equivalent for admission to this master's programme.
- (3) If equivalence has been established in principle but with certain qualifications missing for full equivalence, the Rectorate may require that supplemental examinations be completed during the course of the master's programme.

§ 5 Courses and numbers of participants

(1) Courses without continuous assessment:

1. Lectures (VO) are courses in which subject matter is primarily conveyed in lecture format. They introduce students to research, methods and schools of thought of a given subject.
Maximum number of participants: none

(2) Continuous assessment courses:

1. Practical courses (UE) are concerned with concrete scientific issues within a given subject.
Maximum number of participants: generally 30, for laboratory and equipment-based courses 15.
2. Seminars (SE) are for in-depth treatment of issues, structured around presentations and discussion of student contributions.
Maximum number of participants: generally 30
3. Lectures with practical emphasis (VU) are concerned with the practical treatment of scientific issues raised during lectures.
Maximum number of participants: no maximum for the lecture part, generally 30 for the practical part, 15 for laboratory and equipment-based courses
4. Excursions (EX) are for the demonstration and in-depth treatment of material outside the premises of the university.
Maximum number of participants: none

§ 6 Procedures for the allocation of places in courses with a limited number of participants

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

1. Students for whom non-admission would demonstrably result in a prolonged duration of studies are given priority.
2. If the criterion in 1 does not suffice for the regulation of course admission, priority should be given first to students for whom this is a mandatory module and second to those for whom this is an elective module.
3. If the criteria in 1 and 2 do not suffice for the regulation of course admission, remaining course places are allocated by random draw.

§ 7 Programme structure

- (1) The Master's Programme in Environmental Engineering consists of mandatory modules amounting to a total of 10 ECTS-Credits and elective modules amounting to a total of 82.5 ECTS-Credits. Additionally required is a master's thesis equivalent to 27.5 ECTS-Credits. The elective modules are divided into three content areas, each of which is divided into three proficiency levels. In order to complete the programme of study, students are required to complete modules from all three content areas and at least one module per proficiency level.
- (2) The Master's Programme in Environmental Engineering consists of the content areas "Energy-Efficient Buildings" (referred to in the following as EEG – from German "Energieeffiziente Gebäude"), "Geotechnical Engineering, Surveying and Hydraulic Engineering" (referred to in the following as GVW – from German "Geotechnik, Vermessung und Wasserbau") and "Environmental Engineering and Transportation" (referred to in the following as UVW from German "Umwelttechnik und Verkehrswesen").

1. The content area EEG contains the following elective modules:
 - a. Proficiency level 1: EEG 1-1, EEG 1-2
 - b. Proficiency level 2: EEG 2-1, EEG 2-2, EEG 2-3, EEG 2-4
 - c. Proficiency level 3: EEG 3-1, EEG 3-2, EEG 3-3, EEG 3-4, EEG 3-5, EEG 3-6
2. The content area GVW contains the following elective modules:
 - a. Proficiency level 1: GVW 1-1, GVW 1-2
 - b. Proficiency level 2: GVW 2-1, GVW 2-2, GVW 2-3, GVW 2-4
 - c. Proficiency level 3: GVW 3-1, GVW 3-2, GVW 3-3, GVW 3-4, GVW 3-5, GVW 3-6
3. The content area UVW contains the following elective modules:
 - a. Proficiency level 1: UVW 1-1, UVW 1-2, UVW 1-3, UVW 1-4
 - b. Proficiency level 2: UVW 2-1, UVW 2-2, UVW 2-3, UVW 2-4
 - c. Proficiency level 3: UVW 3-1, UVW 3-2, UVW 3-3, UVW 3-4, UVW 3-5

§ 8 Mandatory and elective modules

- (1) The following mandatory modules, amounting to a total of 10 ECTS-Credits, are to be completed:

1.	Mandatory module: Interdisciplinary Skills	h	ECTS-Credits
	Courses amounting to 7.5 ECTS-Credits are to be chosen according to available spaces from the curricula of diploma or master's programmes at the University of Innsbruck. Especially recommended are courses dealing with gender and findings from women's and gender studies.		7.5
	Total		7.5
	Objective: This module expands the range of the study programme and provides additional qualifications. Students acquire qualifications that allow them to engage in scientific discourse beyond the boundaries of their own field, constructively, responsibly and with sensitivity to gender issues.		
	Prerequisite(s): the prerequisites of the respective curricula are to be fulfilled.		

2.	Mandatory module: Master's Thesis Defense	h	ECTS-Credits
	The oral defense of the master's thesis, held in front of an examination board, concludes the programme of study.		2.5
	Total		2.5
	Objective: To reflect on the master's thesis within the scope of the whole programme, focusing on theoretical understanding, methodology, the communication of results, and presentation abilities.		
	Prerequisite(s): successful completion of all other mandatory and elective modules and the master's thesis		

- (2) Elective modules amounting to 82.5 ECTS-Credits are to be completed as follows; modules are to be selected from the elective module catalogue according to para. 3.
1. Elective modules amounting to 30 ECTS-Credits from proficiency level 1 are to be completed; proficiency level 1 contains the following elective modules:
 - a. EEG 1-1, EEG 1-2
 - b. GVW 1-1, GVW 1-2, GVW 1-3, GVW 1-4
 - c. UVW 1-1, UVW 1-2, UVW 1-3, UVW 1-4
 2. Elective modules amounting to 30 ECTS-Credits from proficiency level 2 are to be completed; proficiency level 2 contains the following elective modules:
 - a. EEG 2-1, EEG 2-2, EEG 2-3, EEG 2-4
 - b. GVW 2-1, GVW 2-2, GVW 2-3, GVW 2-4
 - c. UVW 2-1, UVW 2-2, UVW 2-3, UVW 2-4
 3. Elective modules amounting to 22.5 ECTS-Credits from proficiency level 3 are to be completed; proficiency level 3 contains the following elective modules:
 - a. EEG 3-1, EEG 3-2, EEG 3-3, EEG 3-4, EEG 3-5, EEG 3-6
 - b. GVW 3-1, GVW 3-2, GVW 3-3, GVW 3-4, GVW 3-5, GVW 3-6, GVW 3-7
 - c. UVW 3-1, UVW 3-2, UVW 3-3, UVW 3-4, UVW 3-5

(3) Elective module catalogue

1. Proficiency level 1 elective modules:

1.	Elective module EEG 1-1: Energy-Efficient Buildings 1-1	h	ECTS-Credits
a.	VU Energy-Efficient Buildings Comfort, climate conditions, building envelope, thermal bridge, airtightness, moist air, ventilation, passive solar, energy balances, ideal heating, ideal cooling, load determination, project planning package for passive houses (PHPP), energy performance certificate;	2	2.5
b.	VU Building Services Heat exchangers, heating/cooling load, requirements for heating and hot water, heating/cooling systems, heating/cooling distribution, heating/cooling generation, ventilation, examples of efficient systems;	2	2.5
	Total	4	5
	Objective: Students have an in-depth understanding of the technical fundamentals of energy-efficient building and are able to apply their knowledge to develop practical solutions;		
	Prerequisite(s): none		

2.	Elective module EEG 1-2: Energy-Efficient Buildings 1-2	h	ECTS-Credits
a.	VO Ecological and Economic Aspects of Energy Supply Steady state; basic ecological concepts; CO ₂ , H ₂ O and N ₂ cycles; energy; energy efficiency; energy and environment; greenhouse effect, climate change, energy and business; energy and society; worldwide energy scenarios; outlook: second law of thermodynamics, renewable energy, building standards;	2	2.5
b.	VU Thermodynamics Introduction to thermodynamics; fundamental concepts (system, state and process variables), conservation laws (mass, impulse, energy), first and second laws of thermodynamics and their application; ideal gases and real substances and mixtures; fundamentals of heat transfer;	2	2.5
	Total	4	5
	Objective: Students are familiar with the basics of the energy industry, environmental problems and thermodynamics; they are able to evaluate energy supply approaches from ecological and economic perspectives. They are able to describe simple thermodynamic processes quantitatively and to analyze them. They are familiar with the energy balance of energy transformation processes and are able to determine the parameters necessary to describe the thermodynamic state of various materials.		
	Prerequisite(s): none		

3.	Elective module GVW 1-1: Geotechnic, Surveying and Hydraulic Engineering 1-1	h	ECTS-Credits
a.	SE AK Soil Mechanics Soil behavior in undrained tests, critical state soil mechanics, Eurocode 7: safety approach, critical reflection and application, collapse theorems, dispersive soil properties, unsaturated soils;	2	2.5
b.	VO AK Foundation Engineering Pile foundations (deep), field and laboratory experiments, accuracy, safety, types and applications of geosynthetics;	2	2.5
	Total	4	5
	Objective: Students have an in-depth understanding of modelling in soil mechanics and its use in foundation engineering. They are able to reflect critically on models and to evaluate them. They can study, work and use specialist literature independently. Students are characterized by their competence in writing, presentation, discussion and teamwork.		
	Prerequisite(s): none		

4.	Elective module GVW 1-2: Geotechnic, Surveying and Hydraulic Engineering 1-2	h	ECTS-Credits
a.	VU Geographic Information Systems Theory and classification of GIS, geo-databases, terminology, data types, topology, (geo)data and acquisition, legal aspects, cartography, generalization, data importing and geocoding, 3D-GIS, buffering;	2	2.5
b.	VU Digital Terrain Models and Remote Sensing Data Topography as a spatial planning element and parameter that shapes the environment, digital terrain and surface models, characteristics of grid and vector data, orthophotos, multi-sensory satellite image data, aerial photographs and airborne laser scanning (LIDAR), acquisition and treatment of spatial geodata, suitability of geodata for planning, visualization and representation of spatial data;	2	2.5
Total		4	5
Objective: Students can analyze and evaluate the characteristics and origins of topographic geodata as well as their application and combined use with other data in geographic information systems. They are able to combine different types of data in various coordinate systems, with consideration of legal aspects.			
Prerequisite(s): none			

5.	Elective module GVW 1-3: Geotechnic, Surveying and Hydraulic Engineering 1-3	h	ECTS-Credits
a.	VU Transient Hydraulics Fundamentals of transient and numerical hydraulics in pipes and gravity flow gutters, exercises (hydrodynamics equations and their simplifications);	2	2.5
b.	VU Computational Fluid Dynamics Numerical flow calculation (basics of CFD, numerical methods, shallow water equations, treatment of free surfaces and turbulence);	2	2.5
Total		4	5
Objective: Students have in-depth knowledge of the fundamentals of transient and numerical hydraulics in pipes and gravity flow gutters. They are able to use software for numerical simulation – in 1D, 2D and 3D – of practical problems in hydraulic engineering.			
Prerequisite(s): none			

6.	Elective module GVW 1-4: Geotechnic, Surveying and Hydraulic Engineering 1-4	h	ECTS-Credits
a.	VU Dams Design, construction and monitoring of dams and barriers;	2	2.5
b.	VU Rock and Tunnel Mechanics Mechanical properties of jointed and non-jointed rock; rock grouting; laboratory and field investigations, creep and relaxation of rock; principles of arching in rock, barrier theorems, face stability, stress measurement, surface settlements, rock reinforcement, anchoring, blasting, vibration, mountain streams, springs and swells;	2	2.5

	Total	4	5
	Objective: Students possess fundamental knowledge of the mechanical behavior of rock and its effects on structures in and on rock. They are able to perform design calculations for dams and tunnels and have in-depth knowledge of dam operation. They are to apply relevant theories – not as a block box but based on their understanding of the underlying assumptions.		
	Prerequisite(s): none		

7.	Elective module UVW 1-1: Environmental Engineering and Transportation 1-1	h	ECTS-Credits
	VU Environment Technology Systems Fundamentals of systems analysis and process engineering: physical, chemical, biological and ecological fundamentals; land, water and air pollutants; transportation, conversion and reduction processes; modelling and analysis of environmental technology systems;	4	5
	Total	4	5
	Objective: Students have an in-depth understanding of the scientific fundamentals of environmental technology. They are able to describe and analyze the relevant systems using mathematical models and can apply their knowledge in practice.		
	Prerequisite(s): none		

8.	Elective module UVW 1-2: Environmental Engineering and Transportation 1-2	h	ECTS-Credits
a.	VU Waste Treatment and Disposal Technology Resource balance, waste management systems; latest developments in disposal technology, process engineering methods for land, water and air pollution prevention;	2	2.5
b.	VU Wastewater Treatment and Water Quality Biological-chemical processes for wastewater treatment and for other bodies of water, mathematical description and numerical process modelling, wastewater treatment approaches, software applications;	2	2.5
	Total	4	5
	Objective: Students have in-depth knowledge of the disposal and treatment of liquid and solid waste. They can apply scientific fundamentals to technical systems and know analytic and numerical methods for the design, description and operation of systems.		
	Prerequisite(s): none		

9.	Elective module UVW 1-3: Environmental Engineering and Transportation 1-3	h	ECTS-Credits
a.	VU Traffic and the Environment Environmental compatibility, traffic noise (street, rail and air traffic), sound level measurement and calculations, representation and assessment of traffic noise, noise control measures, vibration, air pollution, space requirements, energy consumption, compensation measures, measures to	2	2.5

	protect animals and plants;		
b.	VU Traffic and Space Utilization Mechanisms affecting spatial planning (regional development approaches, zoning) and traffic planning (mobility, traffic system), design principles and instruments, energy consumption, consequences of various planning strategies; fundamentals and applications of traffic modelling;	2	2.5
	Total	4	5
	Objective: Students are familiar with the methods and techniques for the analysis of existing and planned traffic infrastructure and with their effects on the environment. They are able to use this knowledge to develop and assess traffic infrastructure measures. Students have an in-depth understanding of the interactions between land usage and traffic.		
	Prerequisite(s): none		

10.	Elective module UVW 1-4: Environmental Engineering and Transportation 1-4	h	ECTS-Credits
a.	VU Traffic Planning and Technology Traffic policy, traffic safety, implementation and evaluation of traffic studies, traffic forecasts, evaluation procedures in transportation, performance and assessment of traffic systems;	2	2.5
b.	VU Public Transportation Planning and operation of public road and rail transportation, regular services in urban and regional environments, various types of on-demand transportation, combined transportation authorities (pricing systems);	2	2.5
	Total	4	5
	Objective: Students have in-depth knowledge of traffic planning, traffic technology and transportation management. They possess skills to implement and analyze traffic studies and to develop traffic plans. They are able to plan and assess the services and operations of public transportation in urban and regional environments.		
	Prerequisite(s): none		

2. Proficiency level 2 elective modules:

1.	Elective module EEG 2-1: Energy-Efficient Buildings 2-1	h	ECTS-Credits
a.	VU Building Services Engineering – Advanced Air-conditioning, energy certificate and building services engineering, water and wastewater, conveying equipment, compressed air;	2	2.5
b.	VU Energy-Efficient Ventilation Fundamentals of ventilation: concepts, devices, systems; calculation and planning principles; system design and simulation;	2	2.5
	Total	4	5
	Objective: Students possess in-depth knowledge of selected areas of building services engineering. They are able to evaluate the devices and systems used in building services engineering and can simulate their application in practical examples.		

Prerequisite(s): none

2.	Elective module EEG 2-2: Energy-Efficient Buildings 2-2	h	ECTS-Credits
a.	SE Dimensioning Energy-Efficient Buildings Development plan, shading, optimization of orientation and building envelope (window, wall, roof, floor), thermal bridge, energy balance, building and systems engineering;	2	2.5
b.	VU Building Refurbishment for Energy Efficiency Modernization process; building envelope, ventilation, heating and hot water production; cost-effectiveness, project examples; development of realistic refurbishment approaches using as-built plans and data;	2	2.5
Total		4	5
Objective: Students are familiar with the main issues in the dimensioning of energy-efficient buildings and can apply their knowledge to new construction and refurbishment projects.			
Prerequisite(s): none			

3.	Elective module EEG 2-3: Energy-Efficient Buildings 2-3	h	ECTS-Credits
a.	VU Building and System Simulation Fundamentals of simulation, building modelling, system simulation, storage, solar system and heat pump, applied numerical analysis in building and system simulation, evaluation and interpretation of numerical results;	2	2.5
b.	VU Model Building and Simulation of Buildings Fundamentals of simulation technology, finite difference and finite element methods, networks, applications in buildings and building services engineering;	2	2.5
Total		4	5
Objective: Students are familiar with the fundamentals of simulation technology and can apply this knowledge to building components, buildings and building services engineering.			
Prerequisite(s): none			

4.	Elective module EEG 2-4: Energy-Efficient Buildings 2-4	h	ECTS-Credits
a.	VU Building Physics 2 Thermal building physics: thermal conduction, 1D, 2D, 3D, transparent building components, g-value; ventilation heat loss; ISO building balance; building physics moisture: moisture transfer, moisture storage; transient transport phenomena; acoustics: airborne noise protection, sound bridges, footstep noise protection, room acoustics;	2	2.5

b.	VU Measurement and Control Engineering in Buildings Fundamentals of measurement and sensor technology for buildings and industrial plants; measured value, measurement error, measurement chain; development of measurement plans, control systems for building services engineering;	2	2.5
	Total	4	5
	Objective: Students possess in-depth knowledge of building physics and have the skills to apply appropriate measurement and control technologies in building services engineering.		
	Prerequisite(s): none		

5.	Elective module GVW 2-1: Geotechnic, Surveying and Hydraulic Engineering 2-1	h	ECTS-Credits
a.	SE Soil Mechanics Testing Soil characteristics independent of soil condition (particle size distribution, grain density, consistency limits), soil designation and classification; soil characteristics dependent on soil condition (density, pore content, bulk density, consistency, compressibility); soil characteristics when ground is subject to mechanical influence (behavior during compression, shearing strength); soil characteristics when ground is subject to hydraulic influence (permeability, water absorption capacity); field tests (dynamic probing, plate load test);	2	2.5
b.	VU Theoretical Soil Mechanics Alternating topics, e.g.: soil dynamics, modelling in geotechnical engineering (treatment of large distortions, constraints, general requirements for material models, calibration), failure theories in geotechnical engineering, soil behavior in laboratory experiments, multiphase continua, consolidation theory, elastic anisotropy, shear band development, unsaturated soils, pi-theorem and dimension analysis in soil mechanics, transient groundwater flow;	2	2.5
	Total	4	5
	Objective: Students have an in-depth understanding of the relationship between theoretical concepts and models for laboratory and field experiments in soil mechanics and for the interpretation of results.		
	Prerequisite(s): none		

6.	Elective module GVW 2-2: Geotechnic, Surveying and Hydraulic Engineering 2-2	h	ECTS-Credits
a.	SE Computer Applications in Geotechnical Engineering Foundation design calculations, slope failure analysis, excavation safety, comparison of various material models;	2	2.5
b.	VU Material Models in Soil Mechanics Applicability of typical models compared to real soil conditions: elastoplasticity (Mohr-Coulomb), hypoplasticity, barodesy;	2	2.5
	Total	4	5

	<p>Objective: Students are familiar with the typical material models in geotechnical engineering, know about the limits of their use and their behavior in numerical simulations (e.g. finite element analysis). They have the ability to use standard software independently and thus to perform typical geotechnical engineering calculations responsibly;</p>
	<p>Prerequisite(s): none</p>

7.	Elective module GVW 2-3: Geotechnic, Surveying and Hydraulic Engineering 2-3	h	ECTS-Credits
a.	<p>VU Satellite Positioning Global navigation satellite systems (GNSS), reference and coordinate systems, navigation satellite systems (GPS, GLONASS, Galileo, etc.), sources of error, localization and navigation methods, highly precise point determination, real-time kinematics, earthbound and satellite-supported add-on systems, GNSS receivers;</p>	2	2.5
b.	<p>VU Surface Scanning with Terrestrial Laser Scanners Definitions and physical principles, data (type, structure) and further processing, project structure of a scanning project, hardware, software and applications for laser scanners;</p>	2	2.5
	Total	4	5
	<p>Objective: Students possess wide-ranging knowledge of current measurement technology and understand its use in construction. They are able to apply appropriate measurement techniques for applications in construction surveying (tunneling, transport route construction, building construction, deformation measurement)</p>		
	<p>Prerequisite(s): none</p>		

8.	Elective module GVW 2-4: Geotechnic, Surveying and Hydraulic Engineering 2-4	h	ECTS-Credits
a.	<p>VU Engineering Hydrology Runoff processes and their effects on flood forecasting and flood management in alpine and urban catchment areas;</p>	2	2.5
b.	<p>VU Sediment Transport in Flowing Waters Fundamentals and calculations of sediment transport in flowing waters (sampling, numerical calculations, etc.);</p>	2	2.5
	Total	4	5
	<p>Objective: Students possess fundamental knowledge of modelling hydrological and morphological processes and can apply their knowledge to practical questions. They are able to identify relevant parameters in the field;</p>		
	<p>Prerequisite(s): none</p>		

9.	Elective module UVW 2-1: Environmental Engineering and Transportation 2-1	h	ECTS-Credits
	VU Resource Management Recirculation procedures – recycling resources from waste; resource management in production processes;	4	5
	Total	4	5
	Objective: Students possess in-depth knowledge of the use of waste as a resource. They know the relevant (recycling) techniques and processes to manage resources and can evaluate their efficiency in terms of conserving resources.		
	Prerequisite(s): none		

10.	Elective module UVW 2-2: Environmental Engineering and Transportation 2-2	h	ECTS-Credits
a.	VU Alpine Drinking Water Industry The drinking water industry, fundamentals of hydraulic network simulation and concrete applications, network analysis and system optimization, verification according to current technical standards;	2	2.5
b.	VU Urban Drainage Systems Methods and approaches in urban drainage, sewer system calculations according to hydrodynamic and hydrological procedures, use of software, verification according to current technical standards, scenario analysis;	2	2.5
	Total	4	5
	Objective: Students possess abilities to plan, assess and optimize urban drainage infrastructure networks (water supply and drainage). They know and understand the relevant technical standards and can apply and interpret them. They are able to use and further develop modern numerical methods;		
	Prerequisite(s): none		

11.	Elective module UVW 2-3: Environmental Engineering and Transportation 2-3	h	ECTS-Credits
a.	VU Railroad Construction Route planning, track ballast, slab track, superstructure maintenance and renovation, construction while maintaining service, route and junction performance;	2	2.5
b.	VO Road Construction & Maintenance Construction of the body of the road, foundation and substructure, base and surface layers, road drainage, road equipment, road construction process, structural upkeep of roads;	2	2.5
	Total	4	5
	Objective: Students possess in-depth knowledge of the processes and methods in rail and road construction, operations and maintenance. They are able to apply their knowledge to practical problems and to further develop their knowledge.		
	Prerequisite(s): none		

12.	Elective module UVW 2-4: Environmental Engineering and Transportation 2-4	h	ECTS-Credits
a.	VU Freight Transport Freight transport and logistics, development and forecasting of freight transport for all modes of transport and development of freight transport facilities;	2	2.5
b.	VO High-Performance Rail Design, construction and operation of high-performance rail for freight and passengers;	2	2.5
	Total	4	5
Objective: Students are proficient in the planning, construction and operation of high-performance rail and freight transport systems.			
Prerequisite(s): none			

3. Level 3 Elective Modules:

1.	Elective module EEG 3-1: Energy-Efficient Buildings 3-1	h	ECTS-Credits
a.	VU Solar Thermal Energy Use and Heat Pumps Thermodynamic principles, components, full systems, hydraulic integration, dimensioning;	2	2.5
b.	VU Photovoltaic Physical principles, components, systems, integration into the power grid, economic considerations;	2	2.5
	Total	4	5
Objective: Students possess in-depth knowledge of the technology and applications of renewable energy systems in buildings and are able to apply their knowledge to practical tasks.			
Prerequisite(s): none			

2.	Elective module EEG 3-2: Energy-Efficient Buildings 3-2	h	ECTS-Credits
a.	VU Pipe Hydraulics in Building Services Engineering Basic equations for steady-state flow, with and without friction; laws of resistance, losses, pressure drops in pipes; flow laws; flow losses; cavitation; pump and valve types and their uses, circuit standards, pipe sizing; hydraulic circuits and controls in heating and cooling systems;	2	2.5
b.	VU Thermo-Fluid Dynamics Basic concepts of technical thermodynamics, fluid mechanics and heat transfer, similitude, dimensionless values, fluid kinematics, continuity equation, Navier-Stokes equations, Euler equations, Bernoulli equation, flows (one-dimensional transient, with friction, laminar, turbulent), flow processes with heat transfer; fundamentals of flow machines; introduction to CFD;	2	2.5
	Total	4	5

	<p>Objective: Students are proficient in the theoretical principles of heat transfer and fluid mechanics and can use this knowledge for applications in buildings. They have the ability to apply their knowledge to practical examples.</p>
	<p>Prerequisite(s): none</p>

3.	Elective module EEG 3-3: Energy-Efficient Buildings 3-3	h	ECTS-Credits
a.	<p>VU Energy-Efficient Lighting Fundamentals of daylighting and lights as well as lighting technology, planning, developing lighting systems;</p>	2	2.5
b.	<p>VU Fundamentals of Electrical Engineering Basic supply of electricity in buildings, safety measures, performance;</p>	2	2.5
	Total	4	5
	<p>Objective: Students are familiar with the fundamentals and design of using daylight and lighting as well as with electricity supply in buildings.</p>		
	<p>Prerequisite(s): none</p>		

4.	Elective module EEG 3-4: Energy-Efficient Buildings 3-4	h	ECTS-Credits
	<p>SE Engineering Internship Experience In this seminar, students report on and discuss experiences from their technical internship, which covered a minimum of 160 working hours.</p>	1	2.5
	Total	1	2.5
	<p>Objective: Students have practical working experience and are able to apply their theoretical knowledge in practice.</p>		
	<p>Prerequisite(s): Participation in this seminar requires proof of completion of an appropriate technical internship of 160 working hours after completion of the bachelor's programme.</p>		

5.	Elective module EEG 3-5: Energy-Efficient Buildings 3-5	h	ECTS-Credits
	<p>VU EEG-AK 1 Course covers alternating topics in the area "Energy-Efficient Buildings" (e.g. building physics).</p>	2	2.5
	Total	2	2.5
	<p>Objective: Students possess advanced knowledge and skills in various areas of "Energy-Efficient Buildings". They can approach complex problems independently, applying correct methodology, and can develop innovative solutions.</p>		
	<p>Prerequisite(s): none</p>		

6.	Elective module EEG 3-6: Energy-Efficient Buildings 3-6	h	ECTS-Credits
	VU EEG-AK 2 Course covers alternating topics in “Energy-Efficient Buildings” (e.g. special focus on architectural aspects).	2	2.5
	Total	2	2.5
	Objective: Students possess advanced knowledge and skills in various areas of “Energy-Efficient Buildings”. They can approach complex problems independently, applying correct methodology, and can develop innovative solutions.		
	Prerequisite(s): none		

7.	Elective module GVW 3-1: Geotechnic, Surveying and Hydraulic Engineering 3-1	h	ECTS-Credits
a.	VU Deformation and Monitoring Measurement Objectives and applications of deformation and monitoring measurements; deformation networks – design and compression, reference networks; measurement methods and instruments, measurement values; tachymetry, levelling – measurement, adjustment; network adjustment; geoid undulation in alpine regions;	2	2.5
b.	VU Surveying in Tunnel Construction Basic surveying and measurements during construction in tunneling projects, creation of special tension-free networks between portals; measurement methods and instruments, measurement values: depth sounding, surveying gyroscope; tunnel polygon to check excavation advancement, guide lasers, underground 3D deformation measurement; consideration of external influences;	2	2.5
	Total	4	5
	Objective: Students have in-depth knowledge of highly precise measurement and evaluation procedures in civil engineering and are familiar with the application of these procedures during construction as well as for monitoring structures and outdoor spaces.		
	Prerequisite(s): none		

8.	Elective module GVW 3-2: Geotechnic, Surveying and Hydraulic Engineering 3-2	h	ECTS-Credits
a.	VU Hydroelectric Power Plants Design, construction and monitoring of hydroelectric power plants;	2	2.5
b.	VU Planning Law and Case Studies in Hydraulic Engineering Introduction to planning law, approval processes and implementation of hydraulic engineering projects;	2	2.5
	Total	4	5
	Objective: Students possess in-depth knowledge of the planning and construction of hydroelectric power plants and are able to apply their knowledge to practical examples.		
	Prerequisite(s): none		

9.	Elective module GVW 3-3: Geotechnic, Surveying and Hydraulic Engineering 3-3	h	ECTS-Credits
a.	VU River Engineering and Weirs Design and construction of river engineering systems (including natural hydraulic engineering, renaturation);	2	2.5
b.	VU Stream Engineering and Protection in Alpine Regions Fundamentals of streams, avalanches and erosion (technical and biological protection measures, hazardous zone planning for streams, avalanches, falling rocks and erosion);	2	2.5
	Total	4	5
	Objective: Students possess in-depth knowledge of river engineering planning and construction and are able to implement their knowledge in practice. They are familiar with the fundamentals of streams, avalanches and erosion and can apply this knowledge to practical examples.		
	Prerequisite(s): none		

10.	Elective module GVW 3-4: Geotechnic, Surveying and Hydraulic Engineering 3-4	h	ECTS-Credits
	VU Ice, Snow and Avalanche Mechanics The physics of snow and ice (including metamorphosis of snow), mechanical properties of snow and ice (rheological models, deformation and strength characteristics), ground seepage and laying foundations on ice; snow classification, rooftop snow, snow pressure, avalanche classification, avalanche speed and strength, dynamic models, avalanche danger zones;	2	2.5
	Total	2	2.5
	Objective: Students are familiar with the primary properties of snow, ice and avalanche mechanics and are able to apply this knowledge in practical examples.		
	Prerequisite(s): none		

11.	Elective module GVW 3-5: Geotechnic, Surveying and Hydraulic Engineering 3-5	h	ECTS-Credits
	EX Link to Practice Interdisciplinary project visits with introductions by the project leaders;	2	2.5
	Total	2	2.5
	Objective: Students are familiar with various construction site situations in different phases of projects. After visiting a project, students are able to evaluate it according to quality standards, time parameters and the technologies applied.		
	Prerequisite(s): none		

12.	Elective module GVW 3-6: Geotechnic, Surveying and Hydraulic Engineering 3-6	h	ECTS-Credits
	VU GVW-AK 1 Course covers alternating topics in geotechnical engineering (e.g. field studies on ice, snow and avalanche mechanics).	2	2.5
	Total	2	2.5
	Objective: Students possess advanced knowledge and skills in various areas of geotechnical engineering. They can approach complex problems independently, applying correct methodology, and can develop innovative solutions in various geotechnical engineering contexts.		
	Prerequisite(s): none		

13.	Elective module GVW 3-7: Geotechnic, Surveying and Hydraulic Engineering 3-7	h	ECTS-Credits
	VU GVW-AK 2 Course covers alternating topics in hydraulic engineering (e.g. sediment management).	2	2.5
	Total	2	2.5
	Objective: Students possess advanced knowledge and skills in various areas of hydraulic engineering. They can approach complex problems independently, applying correct methodology, and can develop innovative solutions in various hydraulic engineering contexts.		
	Prerequisite(s): none		

14.	Elective module UVW 3-1: Environmental Engineering and Transportation 3-1	h	ECTS-Credits
a.	VU Bioenergy Technology Methods of generating energy from biomass through direct combustion, gasification and fermentation in comparison to other alternative energy sources;	2	2.5
b.	VU Ecological Balance Life-cycle engineering, ecological assessment software for concrete tasks in environmental engineering;	2	2.5
	Total	4	5
	Objective: Student have an overview of the various methods of ecological assessment in environmental engineering. They have in-depth knowledge of software-assisted life-cycle assessment according to DIN EN 14040 and have knowledge of the production of renewable energy from biogenic waste. This includes scientific principles as well as technological and economic aspects.		
	Prerequisite(s): none		

15.	Elective module UVW 3-2: Environmental Engineering and Transportation 3-2	h	ECTS-Credits
	VU Traffic Engineering Laboratory Introduction and practical implementation of sampling, water and waste analyses; applications in experimental sewage treatment plant, composting and fermentation;	2	2.5
	Total	2	2.5
	Objective: Students can characterize and evaluate physical, chemical and biological methods of analysis and can apply them in a laboratory setting.		
	Prerequisite(s): none		

16.	Elective module UVW 3-3: Environmental Engineering and Transportation 3-3	h	ECTS-Credits
	VU Traffic Management and Telematics In-depth treatment of the conceptual, technical and organizational areas of traffic management, telematics in transportation, systems for traffic management, control and information, traffic centers, vehicle infrastructure integration;	2	2.5
	Total	2	2.5
	Objective: Students have in-depth knowledge of traffic management systems and are familiar with the methods of traffic management and vehicle infrastructure integration;		
	Prerequisite(s): none		

17.	Elective module UVW 3-4: Environmental Engineering and Transportation 3-4	h	ECTS-Credits
	VU UVW-AK 1 Course covers alternating topics in environmental engineering (e.g. AK environmental engineering).	2	2.5
	Total	2	2.5
	Objective: Students possess advanced knowledge and skills in various areas of environmental engineering. They can approach complex problems independently, applying correct methodology, and can develop innovative solutions in various environmental engineering contexts.		
	Prerequisite(s): none		

18.	Elective module UVW 3-5: Environmental Engineering and Transportation 3-5	h	ECTS-Credits
	VU UVW-AK 2 Course covers alternating topics in traffic engineering (e.g. traffic systems).	2	2.5
	Total	2	2.5
	Objective: Students possess advanced knowledge and skills in various areas of traffic engineering. They can approach complex problems independently, applying correct methodology, and can develop innovative solutions in various traffic engineering contexts.		
	Prerequisite(s): none		

- (4) A choice of modules from the advanced courses of the Master's Programme in Civil Engineering is possible as per the specifications of para. 5. The Master's Programme in Civil Engineering is structured the same as the Master's Programme in Environmental Engineering as per § 7 and features the content areas "Materials, Operations, and Project Management" (referred to in the following as BBP – from German "Baustoffe, Baubetrieb und Projektmanagement"), "Constructive Engineering" (referred to in the following as KIB – from German "Konstruktiver Ingenieurbau") and "Modelling and Simulation" (referred to in the following as MOS)
1. The content area BBP contains the following elective modules:
 - a. Proficiency level 1: BBP 1-1, BBP 1-2, BBP 1-3, BBP 1-4
 - b. Proficiency level 2: BBP 2-1, BBP 2-2, BBP 2-3, BBP 2-4
 - c. Proficiency level 3: BBP 3-1, BBP 3-2, BBP 3-3, BBP 3-4, BBP 3-5
 2. The content area KIB contains the following elective modules:
 - a. Proficiency level 1: KIB 1-1, KIB 1-2, KIB 1-3
 - b. Proficiency level 2: KIB 2-1, KIB 2-2, KIB 2-3, KIB 2-4
 - c. Proficiency level 3: KIB 3-1, KIB 3-2, KIB 3-3, KIB 3-4, KIB 3-5, KIB 3-6, KIB 3-7, KIB 3-8
 3. The content area MOS contains the following elective modules:
 - a. Proficiency level 1: MOS 1-1, MOS 1-2, MOS 1-3
 - b. Proficiency level 2: MOS 2-1, MOS 2-2, MOS 2-3, MOS 2-4
 - c. Proficiency level 3: MOS 3-1, MOS 3-2, MOS 3-3, MOS 3-4, MOS 3-5
- (5) A content area of the Master's Programme in Environmental Engineering amounting to a maximum of 20 ECTS-Credits can be replaced by a content area from the Master's Programme in Civil Engineering of the same number of credits (exchange of a content area). At least one module from each proficiency level is to be completed in the content area taken from the Master's Programme in Civil Engineering. The Director of Studies is to be informed in writing of an exchange of a content area; notification is to take place in the first semester until the end of the extended registration period. The exchange of an elective module following a first examination attempt is not permitted.

§ 9 Master's thesis

- (1) The Master's Programme in Environmental Engineering requires the completion of a master's thesis amounting to 27.5 ECTS-Credits. The master's thesis serves to demonstrate the ability to treat a scientific topic independently and with proper consideration of content and method.
- (2) The topic of the master's thesis is to be selected from the completed elective modules of the content areas.
- (3) If both master's programmes are being pursued (Civil Engineering and Environmental Engineering), the topic of the master's thesis may not be selected twice from the same content area.
- (4) Students are to inform the Director of Studies of their topic and supervisor in writing. Prerequisites are fulfillment of all conditions as per § 64 para. 5 UA 2002 and successful completion of proficiency level 1 of the module of the content area from which the topic of the master's thesis is taken.
- (5) Students are entitled to propose the topic of the master's thesis or to choose from a list of topics.
- (6) Students are entitled to write the master's thesis in English if the supervisor agrees.

§ 10 Examinations

- (1) Performance assessment is based on course examinations. Course examinations are defined as follows:
 1. Examinations that assess the knowledge and skills covered in an individual course in which assessment is based on a single examination at the end of the course. The course instructor is to determine and announce the method of examination (written and/or oral) before the course begins.
 2. Courses with continuous assessment in which assessment is based on regular written and/or oral contributions by participants. The assessment criteria are to be determined and announced by the instructor before the course begins.
- (2) Assessment of the module Defense of the Master's Thesis is based on an oral exam in front of an examination board consisting of three examiners.

§ 11 Academic degree

Graduates of the Master's Programme in Environmental Engineering are awarded the academic degree "Diplomingieurin" (female) or "Diplomingenieur" (male), abbreviated as "Dipl.-Ing." Or "DI".

§ 12 Date of effect

This curriculum is effective as of 1 October 2014 and applies to all students who begin their degree programme as of winter semester 2014/15.

Anlage: Anerkennung von Prüfungen

Die nachstehenden, im Rahmen des Masterstudium Bau- und Umweltingenieurwissenschaften, an der Universität Innsbruck (Curriculum kundgemacht im Mitteilungsblatt vom 4. Mai 2007, 50. Stück, Nr. 224) positiv beurteilten Prüfungen werden gemäß § 78 Abs. 1 Universitätsgesetz 2002 für das Masterstudium Umweltingenieurwissenschaften an der Universität Innsbruck als gleichwertig anerkannt wie folgt:

Nr	Masterstudium Bau- und Umweltingenieurwissenschaften			ÄQUIVALENZ		Masterstudium Umweltingenieurwissenschaften			
	LV-Titel	Typ SSt	ECTS	Bau-Umwelt => Umwelt	Umwelt => Bau-Umwelt	LV Titel	Typ SSt	ECTS	Modul
22	Bauingenieurexkursion	EX2	1.0	A22=N22, A22=N178	N22=A22	Brücke zur Praxis	EX1	2.5	BBP 3-3
31	Alternative Energiekonzepte	VO2	3.0	A31=N31	N31=A31	Ökologische und ökonomische Aspekte der Energieversorgung	VO2	2.5	EEG 1-2
32	Konstruktive Bauphysik	VU2	2.5	A32=N32	N32=A32	Energieeffiziente Gebäude	VU2	2.5	EEG 1-1
33	Gebäudetechnik 1	VO3	3.5	A33=N33	N33=A33	Gebäudetechnik	VU2	2.5	EEG 1-1
34	Thermodynamik	VU2	3.0	A34=N34	N34=A34	Thermodynamik	VU2	2.5	EEG 1-2
35	Bauphysik 2	VU3	2.5	A35=N35	N35=A35	Bauphysik 2	VU2	2.5	EEG 2-4
36	Gebäudetechnik 2	VO2	2.5	A36=N36	N36=A36	Gebäudetechnik Vertiefung	VU2	2.5	EEG 2-1
37	Gebäude- und Anlagensimulation	VU2	2.5	A37=N37	N37=A37	Gebäude- und Anlagensimulation	VU2	2.5	EEG 2-3
38	Gebäudetechnik 2	UE2	2.5	A38=N38	N38=A38	Dimensionierung energieeffizienter Gebäude	SE2	2.5	EEG 2-2
39	Energiekonzepte im Hochbau	VU2	2.5	A39=N39	N39=A39	Energieeffiziente Lüftungstechnik	VU2	2.5	EEG 2-1
40	Reflexion der Praxistätigkeit	SE1	2.5	A40=N54, A40=N130		Mess- und Regelungstechnik im Gebäude	VU2	2.5	EEG 2-4
41	Nachhaltige Gebäudesanierung	VU3	3.5	A41=N41	N41=A41	Energetische Gebäudesanierung	VU2	2.5	EEG 2-2
42	Rohrhydraulik	VU2	2.5	A42=N42	N42=A42	Rohrhydraulik in der Gebäudetechnik	VU2	2.5	EEG 3-2
43						Modellbildung und Simulation von Gebäuden	VU2	2.5	EEG 2-3
44	Erneuerbare Energien	PJ2	3.0	A44=N44	N44=A44	Thermische Solarenergienutzung und Wärmepumpen	VU2	2.5	EEG 3-1
45	Photovoltaik	VO1	1.5	A45=N45	N45=A45	Photovoltaik	VU2	2.5	EEG 3-1
46	Hochbau 3	VU3	2.5	A46=N46	N46=A46	EEG-AK 1	VU2	2.5	EEG 3-5
47	Thermofluidynamik	VU2	2.5	A47=N47	N47=A47	Thermofluidynamik	VU2	2.5	EEG 3-2
48						Energieeffiziente Beleuchtung	VU2	2.5	EEG 3-3
49						Grundlagen der Elektrotechnik	VU2	2.5	EEG 3-3
50						EEG-AK 2	VU2	2.5	EEG 3-6
54					N54=A40, N54=A130	Erfahrungsberichte aus der Ingenieurpraxis	SE1	2.5	EEG 3-4
69	AK Bodenmechanik	SE2	2.5	A69=N69	N69=A69	AK Bodenmechanik	SE2	2.5	GVW 1-1
70	AK Grundbau	VO2	2.5	A70=N70	N70=A70	AK Grundbau	VO2	2.5	GVW 1-1
71	Bodenmechanisches Versuchswesen	SE2	2.5	A71=N71	N71=A71	Bodenmechanisches Versuchswesen	SE2	2.5	GVW 2-1
72	Computeranwendungen in der Geotechnik	SE2	2.5	A72=N72	N72=A72	Computeranwendungen in der Geotechnik	SE2	2.5	GVW 2-2
73	Fels- und Tunnelmechanik	VU3	2.5	A73=N73	N73=A73	Fels- und Tunnelmechanik	VU2	2.5	GVW 1-4
74	Schnee- u. Eismechanik, Lawinenkunde	VO2	2.5	A74=N74	N74=A74	Eis-, Schnee- und Lawinenmechanik	VU2	2.5	GVW 3-4
75						Theoretische Bodenmechanik	VU2	2.5	GVW 2-1
76						Materialmodelle in der Bodenmechanik	VU2	2.5	GVW 2-2
77						GVW-AK 1	VU2	2.5	GVW 3-6

86	Verkehr und Umwelt	VU2	2.5	A86=N86	N86=A86	Verkehr und Umwelt	VU2	2.5	UVW 1-3
87	Verkehrsplanung und Verkehrstechnik	VU3	2.5	A87=N87	N87=A87	Verkehrsplanung und Verkehrstechnik	VU2	2.5	UVW 1-4
88	Stadtverkehrsplanung	VU2	2.5	A88=N89		Öffentlicher Verkehr	VU2	2.5	UVW 1-4
89					N89=A88	Verkehr und Raumnutzung	VU2	2.5	UVW 1-3
91						Verkehrsmanagement und Telematik	VU2	2.5	UVW 3-3
92	Anlagen und Techniken des Güterverkehrs	VU2	2.5	A92=N92	N92=A92	Güterverkehr	VU2	2.5	UVW 2-4
95						UVW-AK 2	VU2	2.5	UVW 3-5
97	Eisenbahnbau	VU3	2.5	A97=N97	N97=A97	Eisenbahnbau	VU2	2.5	UVW 2-3
98	Straßenbau und Straßenerhaltung	VO2	2.5	A98=N98	N98=A98	Straßenbau und Straßenerhaltung	VO2	2.5	UVW 2-3
99	Hochleistungsverkehr	VO2	2.5	A99=N99	N99=A99	Hochleistungsbahnen	VO2	2.5	UVW 2-4
130	Praxis im Bau- und Umweltingenieurwesen	SE2	1.5	A130=N130, A130=N54	N130=A130	Erfahrungsberichte aus der Ingenieurpraxis	SE1	2.5	KIB 3-6
147	Abfallbehandlung und Entsorgungstechnik	VU3	2.5	A147=N147	N147=A147	Abfallbehandlung und Entsorgungstechnik	VU2	2.5	UVW 1-2
148	Alpine Trinkwasserwirtschaft	VU2	2.5	A148=N148	N148=A148	Alpine Trinkwasserwirtschaft	VU2	2.5	UVW 2-2
149	Bioenergietechnik	VU2	2.5	A149=N149	N149=A149	Bioenergietechnik	VU2	2.5	UVW 3-1
150	Ressourcenmanagement	VU2	2.5	A150=N150	N150=A150	Ressourcenmanagement	VU4	5	UVW 2-1
151						Abwasserreinigung und Gewässergüte	VU2	2.5	UVW 1-2
152	Systemanalytik und Verfahrenstechnik 1	VU2	2.5	A152+A153=N152	N152=A152+A153	Umwelttechnische Systeme	VU4	5	UVW 1-1
153	Systemanalytik und Verfahrenstechnik 2	VU2	2.5	A152+A153=N152		Ökobilanzen	VU2	2.5	UVW 3-1
154	Siedlungsentwässerung und Gewässergüte	VU3	2.5	A154=N154	N154=A154	Urbane Entwässerungssysteme	VU2	2.5	UVW 2-2
155						Labor Umwelttechnik	VU2	2.5	UVW 3-2
156						UVW-AK 1	VU2	2.5	UVW 3-4
160	Geoinformationssysteme	VU2	2.5	A160=N160	N160=A160	Geoinformationssysteme	VU2	2.5	GVW 1-2
161	Koordinaten- und Positionsbestimmung mit GPS	VU2	2.5	A161=N161	N161=A161	Satellitengestützte Positionierung	VU2	2.5	GVW 2-3
162	Photogrammetrie und digitale Geländemodelle	VU2	2.5	A162=N162	N162=A162	Digitale Geländemodelle und Fernerkundungsdaten	VU2	2.5	GVW 1-2
163	Überwachungs- und Präzisionsvermessung im alpinen Raum	VU2	2.5	A163=N163	N163=A163	Deformations- und Überwachungsmessung	VU2	2.5	GVW 3-1
164						Vermessung im Tunnelbau	VU2	2.5	GVW 3-1
165						Oberflächenerfassung mit terrestrischen Laserscannern	VU2	2.5	GVW 2-3
168	Computational Fluid Dynamics	VU2	2.5	A168=N168	N168=A168	Computational Fluid Dynamics	VU2	2.5	GVW 1-3
169	Flussbau und Gewässerökologie	VU2	2.5	A169=N169	N169=A169	Flussbau und Flusssperren	VU2	2.5	GVW 3-3
170	Hydraulik 2	VU2	2.5	A170=N170	N170=A170	Instationäre Hydraulik	VU2	2.5	GVW 1-3
171						Wasserkraftanlagen	VU2	2.5	GVW 3-2
172	Wildbach- und Lawinerverbauung	VU2	2.5	A172=N172	N172=A172	Wildbachkunde und Schutztechnik im alpinen Raum	VU2	2.5	GVW 3-3
173	Ingenieurhydrologie und Flussgebietsmanagement	VU2	2.5	A173=N173	N173=A173	Ingenieurhydrologie	VU2	2.5	GVW 2-4
174	Wasser- und Umweltrecht	VO2	2.5	A174=N174	N174=A174	Planungsrecht und Fallbeispiele im Wasserbau	VU2	2.5	GVW 3-2
175						Feststofftransport in Fließgewässern	VU2	2.5	GVW 2-4
176	Wasserbau und Wasserkraft im alpinen Raum	VU2	2.5	A176=N176	N176=A176	Talsperren	VU2	2.5	GVW 1-4
177						GVW-AK 2	VU2	2.5	GVW 3-7
178					N178=A22	Brücke zur Praxis	EX1	2.5	GVW 3-5