

Universität für Bodenkultur Wien

University of Natural Resources and Life Sciences, Vienna



## Curriculum

for the Master Programme in

## Alpine Natural Dangers / Watershed Regulation

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For legal purposes, only the version of the curriculum that has been published in the official journal (Mitteilungsblatt) is binding and valid - this English translation is for information purposes only.

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**Curriculum of the Master Programme**  
**“Alpine Natural Dangers/Watershed Regulation”**  
At the University of Natural Resources and Life Sciences, Vienna  
*As at October 1<sup>st</sup>, 2015*

## **§ 1 QUALIFICATION PROFILE**

The Master programme in Alpine Natural Dangers / Watershed Regulation is a degree programme which serves to deepen and extend students' pre-vocational academic education, building on the basis provided by a Bachelor degree programme (§ 51 [2] item 5 of the Universities Act UG 2002, Federal Law Gazette BGBl I no. 81/2009). The programme fulfils the requirements of Directive 2005/36/EC on the recognition of professional qualifications, article 11, letter e.

Mankind's' living space is struck by natural hazards in many ways. Changing requirements for life enhance the demand for the utilization of alpine regions and lead to a scarcity of those habitats protected from natural hazards. Also economic development and agriculture are dependent on the availability of permanently utilizable areas. With this intensified land use damages and vulnerability of society are also increased. Therefore, the protection from natural hazards in mountainous regions has become a political issue. Natural hazards such as floods, mudflows, avalanches, rock slides and erosion are no longer simply accepted. Safety measures via technical methods, bioengineering or regional planning are a precondition for a long lasting settlement, sustainable cultivation management and touristy use of these areas.

### **1a) Knowledge and Personal and Professional Skills**

In the Master programme Alpine Natural Hazards / Watershed Regulation students acquire the knowledge and abilities necessary for a responsible contact and handling with dangers in the alpine region. The education and training is geared to the circuit of “Integral Risk Management” in order to reach the aimed educational goals. Thereby, precaution, prevention of natural hazards and their handling are regarded as the pillars of the study programme Alpine Natural Hazards / Watershed Regulation. Apart from natural scientific and technical courses, also questions of natural hazards laws, land use planning, disaster control and emergency management are sustainable elements of the study programme.

The focus of this education is based on the prevention of natural hazards. The individual danger modules in each case include danger analyses, detection of protection deficits and planning of active protection measures for the natural hazard types water (floods, mudflows), snow (avalanches) and solid matter (downfall, slides). The technical education is intensified by a structurally engineered module. Also forestal and environmental foci and application-oriented knowledge are communicated in order to also be enabled to carry out needed procedures in the complete zone of attraction of torrents and avalanches. The technical education is strengthened through appropriate elective courses.

Graduates are able to identify the potential dangers of the alpine region and are empowered to plan efficient protection strategies and measurements for prevention. Due to the combination of technical and forestall procedures, bioengineering and regional planning,

danger prevention is optimised. Graduates are enabled to plan projects and lead those, as well as present them in a traceable manner. Knowledge in the fields of danger prevention, risk provision to guard against risk and disaster management empowers them to conduct integral risk management. Social competences such as the capacity for teamwork, leading qualities and independent working skills are strengthened by the multifaceted education. Problem solving skills are promoted by the cross linking of ecological, technical and socio-economical aspects.

Graduates of the Master study programme Alpine Natural dangers / Watershed Regulation are equipped with knowledge in the fields of administration and economy which is necessary in order to work successfully. They have abilities in the fields of communication, coordination and leadership and they know of the importance of mobility, language skills and internationality for their successful professional work.

### **1b) Professional Qualifications**

Alpine Natural Dangers / Watershed Regulation comprises the following fields of activities:

- Evaluation and analysis of dangers and matter displacement processes in the alpine region
- Prevention of alpine natural hazards
- Watershed management
- Risk provisioning
- Disaster handling

Graduates of the Master degree programme Alpine Natural Dangers/Watershed Regulation are especially enabled to work in the following fields of work:

- Public sector, e.g. sheeting for the forest-technical service for mountain torrents, avalanches and landslides, provincial government, ministries, institutions for infrastructure and in public administration
- Tertiary sector, e.g. engineering and construction offices, consulting, planning and managing of projects
- Self-employed, e.g. self-employed engineering advisors, appraiser and project manager
- Research and development, e.g. at universities and public research and development centres

## **§ 2 ADMISSION REQUIREMENTS**

Graduates of the Bachelor programmes in Forestry (H 225) and Environmental Engineering (H 231) offered by the University of Natural Resources and Life Sciences, Vienna or professionally equivalent Bachelor programmes of accredited national or international universities are eligible for admission. Proof of knowledge and skills from the fields of “Hydraulics & Hydromechanics” (to an extent of at least 5 ECTS) as well as “Forestal Land Use Engineering” (to an extent of at least 6 ECTS) has to be provided. Otherwise, this expertise has to be acquired during the study programme.

For graduates of other Bachelor programmes, mastery of the following learning outcomes is required for admission:

(1) Basic skills in natural and technical sciences:

Maths, physics, geology/geomorphology, botany, ecology, surveying and mapping, mechanics of materials, dendrology, meteorology, statistics, geoinformation, mechanics, technical drawing with CAD, soil studies / forest soil studies, statics, material science.

(2) Skills in the core subjects:

Torrent and avalanche control, forest engineering, geographical information systems, hydraulics, hydrology, hydraulic structures design, construction engineering, geotechnical engineering, spatial planning, silviculture, forest protection, forest entomology, wildlife biology, forest ecology, forest law, forest growth and yield.

When competences and skills of both areas can be assured via the positive completion of courses to an extent of 40 ECTS credit points each, a direct admission to the study programme takes place.

Furthermore, competences in English at a level of B2 (according to the Common European Framework of Reference for Languages by the Council of Europe) are recommended.

## **§ 3 PROGRAMME STRUCTURE**

### **3a) Duration, Total ECTS Credits and Structure**

The programme consists of courses and other requirements worth a total of 120 ECTS credits. This is equivalent to a duration of four semesters (a total of 3,000 60-minute credit hours). The programme is divided into

Compulsory courses:	22 ECTS credits
Compulsory internship:	2 ECTS credits
Master’s Thesis:	30 ECTS credits
Elective courses:	50 ECTS credits
Free electives:	18 ECTS credits

Students are required to complete courses worth a total of 8 ECTS credits taught in a foreign

language. These courses can be compulsory courses, elective courses, internships or free electives. Courses taken at international universities abroad are to be credited. General language courses (with the exception of specialised language courses) will not be considered. (General foreign language courses may be credited in the framework of free elective courses.)

### **3b) Three-Pillar Principle**

The three-pillar principle is one of the central identifying characteristics of both the Bachelor and Master programmes offered at the University of Natural Resources and Life Sciences, Vienna. In the master programmes, the sum of the compulsory and elective courses must be made up of at least

- 15% technology and engineering
- 15% natural sciences
- 15% economic and social sciences, law

The Master's Thesis, compulsory internship and free electives are excluded from the three-pillar rule.

### **3c) Limited Number of Participants in Courses**

For courses with a limited number of participants the head of the Master course is authorised to first admit students enrolled in the Master programme (that means that students enrolled in a Bachelor study programme can only be admitted to the courses if further spaces are left on the course!) The admission of students enrolled in the Master study programme is conducted according to the following order of required courses by the students: compulsory course, elective course, free elective course.

## § 4 COMPULSORY COURSES

### Used Abbreviations:

ECTS = European Credit Transfer System points

WS = Winter Semester

SS = Summer Semester

<sup>1)</sup> In English

<sup>2)</sup> In English and German

<sup>3)</sup> Courses not offered in academic year 2016/17

<sup>4)</sup> Courses only offered in even years

<sup>5)</sup> Courses only offered in uneven years

The following compulsory courses worth a total of 22 ECTS credits are required to complete the Master programme:

Course Number	Subject (Module)	Course Type	Semester	ECTS Credits
	<b>Course Title</b>			
	<b>Hydrological Hazards</b>			
871343	Hydrological hazards - analysis and assessment	VS	SS	3.0
871344	Hydrological hazards - mitigation measures	VX	SS	3.0
816350	Runoff formation in torrential headwater basins	SE	WS	2.0
	<b>Snow and Avalanche Hazards</b>			
871345	Snow and avalanche hazards - analysis and evaluation	VX	WS	3.0
871346	Technical protection measures: avalanches	VX	WS	3.0
	<b>Hazards due to Mass Movements</b>			
872301	Landslide hazards	VS	WS	3.0
871347	Hazards due to mass movements - rockfall	VX	WS	3.0
870301	<b>Master's Thesis Seminar</b>	SE	WS/ SS	2.0

Learning outcomes - Students have the required skills, abilities and competences to fulfill the following tasks:

- Identification and analysis of the following processes:  
Torrent-relevant processes (high water and flooding, sediment transport, mudflow), ongoing processes in the snow cover (snow physics, avalanche dynamics), mass movements (gliding and falling)
- Identification and assessment of relevant hazard scenarios
- Planning of protection strategies and preventative measures

## § 5 ELECTIVE COURSES

Elective course modules worth a total of 50 ECTS credits are required to complete the Master programme. In this connection, at least one specialisation block each has to be completed from the three areas (basics, core and application).

Course Number	Basics	Course Type	Semester	ECTS Credits
	<b>Course Title</b>			
	<b>Specialisation: Silvicultural principles of natural hazard management</b>			
913322	Silviculture and forest protection	VU	WS	5.0
912326	Mountain forest ecosystems	VS	WS	3.0
	<b>Specialisation: Technical principles of natural hazard management</b>			
875321	Design of protection works	VU	WS	4.0
873310	Fundamentals of geotechnical engineering	VU	WS	4.0
	<b>Specialisation: Ecological principles of natural hazard management</b>			
871361	Environmental aspects in the flood protection	VX	WS	3.0
812383	Aquatic ecology and river morphology	VO	WS	3.0

Learning outcomes - Students have the required expertise, abilities and competences:

- Basic knowledge of silvicultural technology with a specialisation in mountain forests including protective functions as well as knowledge of the most important pest organisms in these ecosystems
- Competence to calculate and constructively design simple supporting structures (retaining walls, snow bridges, torrent dams), as well as independent processing of simple subsurface investigation measures; knowledge of geotechnical basics relevant for the planning of protective structures; knowledge in order to deal with foundation questions and assessment of ground risks
- Fundamental understanding of morphological processes and their interrelations with aquatic biocenoses

Course Number	Core Subjects	Course Type	Semester	ECTS Credits
	<b>Course Title</b>			
	<b>Specialisation Construction Management and structural engineering</b>			
875322	Construction methods and management for barrier structures	SX	SS	2.0
875323	Structural maintenance and monitoring	VU	SS	2.0
875325	Structural and objective based protection measures	VX	SS	4.0
	<b>Specialisation protection forest management and soil bioengineering</b>			
916319	Afforestation and forest protection near the timberline	VX	SS	3.0
874330	Soil bioengineering techniques	VO	SS	2.0



913323	Management of protective forests	VX	SS	3.0
832303	Wildlife ecology in protective and in selectively harvested forest stands	VO	SS	1.5
	<b>Specialisation Socioeconomics and law</b>			
855323	Spatial planning in alpine areas	VO	SS	2.0
736316	Nature danger law	VO	WS	2.0
871362	Vulnerability and risk management	VS	WS	2.5
871363	Introduction to natural hazard management	VO	WS	1.5
	<b>Specialisation risk provisioning</b>			
871366	Civil protection	VX	WS	1.5
871367	Communication, information and participation	VO	WS	3.0
871368	Forecasting and warning systems	VO	WS	1.5
	<b>Specialisation civil protection</b>			
871369	Event documentation and damage analysis	VO	WS	1.5
871370	Disaster management and emergency services	VX	WS	1.5
871374	Politics of natural hazards and risk governances	SE	WS	1.5
871372	Damage adjustment	VO	WS	1.5

Learning outcomes - Students gain in-depth knowledge, skills and competences:

- In planning, realizing, supervising and assessing projects, measures for building maintenance, monitoring systems for protective structures as well as applying and realizing knowledge for measures of technical building protection
- In relation to a sustainable land use management and high altitude afforestation
- In relevant legal basics, understanding concepts and problems of land use planning in alpine areas
- In the field of methods of disaster control and of economic assessment methods of natural hazards and protection measures as well as a basic understanding of integral risk management
- In the application of communication methods, information and participation, on the possibilities and limitations of applications of monitoring and warning systems
- In the systematic documentation of events, the instruments of claim settlements and of incident management / emergency response organizations
- Insights into natural hazards politics and possible adaptation strategies

Course Number	Field of Application	Course Type	Semester	ECTS Credits
	<b>Course Title</b>			
	<b>Specialisation Watershed management</b>			
871348	Watershed management	PJ	SS	6.0
	<b>Specialisation modelling and simulation</b>			
871358	Dynamics of geophysical flows <sup>1</sup>	VS	WS	3.0
871364	Scenario development and analysis <sup>1</sup>	VU	SS	2.0
871365	Simulation models in natural hazards analysis <sup>1</sup>	PR	WS	3.0

	<b>Specialisation Forest and Construction Site Development</b>			
915303	Road network planning	VS	WS/SS	5.0
915314	Harvesting systems	SE	SS	3.0

Learning outcomes:

Students gain deepened knowledge, skills and competences in order to combine technical, silvicultural, bioengineering and regional planning-related measures for the optimization of hazard prevention.

Graduates have the ability to apply and interpret various simulation models and they know of the possibilities and limitations of these.

Furthermore, graduates know how to install and calculate forest roads and cable systems for forest and construction site development.

## **§ 6 FREE ELECTIVES**

Free electives worth a total of 18 ECTS credits are required to complete the Master programme. Free electives may be selected from all courses offered by all recognized universities in Austria and abroad. Free electives are intended to impart knowledge and skills in the student's own academic subject as well as in fields of general interest.

It is recommended to choose the free electives from the offered list of elective courses.

## **§ 7 MASTER'S THESIS**

A Master's Thesis is a paper on a scientific topic, to be written as part of a Master degree programme (For exceptions please see the By Laws of the University of Natural Resources and Life Sciences, Vienna, part III- Teaching, § 30[9]). The thesis is worth a total of 30 ECTS credits. With their Master's Thesis, students demonstrate their ability to independently address a scientific topic, both thematically and methodologically (§ 51 [8] UG 2002 BGBl. I no. 81/2009).

The topic of a Master's Thesis shall be chosen in such a way that it is reasonable to expect a student to be able to complete it within six months. Multiple students may jointly address a topic, provided that the performance of individual students can be assessed (§ 81 [2] UG 2002 BGBl. I no. 81/2009).

The Master's Thesis shall be written in German or English. Languages other than German or English are permissible only if approved and confirmed by the thesis supervisor. The thesis defence must be held in German or English regardless of the language of the thesis.

## **§ 8 COMPLETION OF THE MASTER PROGRAMME**

The Master programme in Alpine Natural Dangers / Watershed Regulation has been completed when the student has passed all required courses and received a positive grade on the Master's Thesis and defence examination.

## **§ 9 ACADEMIC DEGREE**

Graduates of the Master programme in Alpine Natural Dangers / Watershed Regulation are awarded the academic title Diplom-Ingenieur (m) or Diplom-Ingenieurin (f), abbreviated as Dipl.-Ing./ Dipl.-Ing.<sup>in</sup> or DI/DI<sup>in</sup>.

The academic title Dipl.-Ing./Dipl.-Ing.<sup>in</sup> or DI/DI<sup>in</sup>, if used, shall precede the bearer's name (§ 88 [2] UG 2002 BGBl. I no. 81/2009).

## **§ 10 EXAMINATION REGULATIONS**

(1) The Master Programme in Alpine Natural Dangers / Watershed Regulation has been completed successfully when the following requirements (corresponds to components in [7] below) have been met:

- positive completion of compulsory courses worth a total of 22 ECTS credits (§ 4)
- positive completion of elective courses worth a total of 50 ECTS credits (§ 5)
- positive completion of free electives worth a total of 18 ECTS credits (§ 6)
- a positive grade on the Master's Thesis (30 ECTS credits) and the defence examination.

(2) Student evaluation takes the form of course and module examinations. Course examinations can be either written or oral, as determined by the course instructor, taking the ECTS credit value of the course into account. Any prerequisites for admission to examinations shall be listed in § 4 under the respective course/module.

(3) The choice of examination method shall be based on the type of course: Lectures shall conclude with a written or oral examination, if continuous assessment of student performance is not applied. Seminars and project-based courses can be evaluated based on independently written papers, length and contents of which are determined by the course instructor. For all other course types, the examination type is at the instructor's discretion.

(4) The topic of the Master's Thesis shall be selected from one of the subjects of the Master programme. The student must inform the dean in writing prior to the commencement of the work on the Master's Thesis. Thereby, the student has to state the Master's Thesis topic as well as the name of the supervisor of the Master's Thesis.

(5) The completed Master's Thesis which has been assessed positively by the supervisor shall be publically presented by the student and defended in the form of an academic discussion (defence examination) after successful completion of all courses. The committee shall consist of a committee chair and two additional university lecturers with a *venia docendi* or equivalent qualification. The student's total performance (thesis and defence examination) will be assigned a comprehensive grade. Both thesis and defence examination must receive a passing grade for the student to complete the programme. The written evaluations stating the grounds for the thesis grade and the defence examination grade are included in calculating the comprehensive grade and are documented separately.

The comprehensive grade is calculated as follows:

- Master's Thesis: 70%
- Defence examination (incl. presentation): 30%

(6) A comprehensive evaluation of the student's performance on the entire programme shall be assigned. A comprehensive evaluation of "passed" means that each individual component of the programme was completed successfully. If individual components of the programme have not been successfully completed, the comprehensive evaluation is "failed". A comprehensive evaluation of "passed with honours" is granted if the student has received no grade worse than a 2 (good) on all individual components, and if at least 50% of the individual components were graded with 1 (excellent).

## **§ 11 TRANSITIONAL PROVISIONS**

Students who are subject to the Master curriculum Alpine Natural Dangers / Watershed Regulation (H 477, version 11U from October 1<sup>st</sup>, 2011) that was in action to date, are entitled to complete their study programme until November 30, 2016.

For students who switch to the new Master programme curriculum, examinations for courses taken under the provisions of the previously valid curriculum shall be recognized towards the new programme under the provisions of this curriculum based on the list of equivalent courses.

## **§ 12 EFFECTIVE DATE**

This curriculum shall take effect on October 1<sup>st</sup>, 2015.

## **ANNEX A      TYPES OF COURSES**

The following types of courses are available:

### **Lecture (VO)**

Lectures are courses in which certain areas of a subject and the methods used in this area are imparted through didactic presentation.

### **Lab Course (UE)**

Lab courses are courses in which students are instructed in specific practical skills, based on theoretical knowledge.

### **Practical Course (PR)**

Practical courses are classes in which students deal with specific topics independently, based on previously acquired theoretical and practical knowledge.

### **Compulsory Internship Seminar (PP)**

The compulsory internship seminar is a class in which students deal independently with topics related to their internship placements, based on previously acquired theoretical and practical knowledge.

### **Seminar (SE)**

Seminars are courses in which students are required to work independently on the respective subject, deepen their knowledge of the topic and discuss relevant issues.

### **Field Trips (EX)**

Field trips are courses in which students have the opportunity to experience relevant fields of study in real-life practical application, to deepen their knowledge of the respective subject. Field trips can be taken to destinations both in Austria and abroad.

### **Master's Thesis Seminar (MA)**

Master's Thesis seminars are seminars intended to provide students with academic support during the thesis writing process.

### **Project Course (PJ)**

Project courses are characterized by problem-based learning. Under instruction, students work (preferably in small groups) on case studies, applying appropriate scientific methods.

### ***Mixed-Type Courses:***

Mixed-type courses combine the characteristics of the courses named above (with the exception of project-type courses). Integration of different course-type elements improved the didactic value of these courses.

### **Lecture /Seminar (VS)**

### **Lecture/Lab (VU)**

### **Lecture/Field Trip (VX)**

### **Seminar/Field Trip (SX)**

### **Lab/Seminar (US)**

### **Lab/Field Trip (UX)**