



**Tempus Project: QANTUS**



# **BOKU Experiences with Implementation of Bologna Process Part I**

**Willibald Loiskandl**

- Content

Introduction on University structure

Historical development

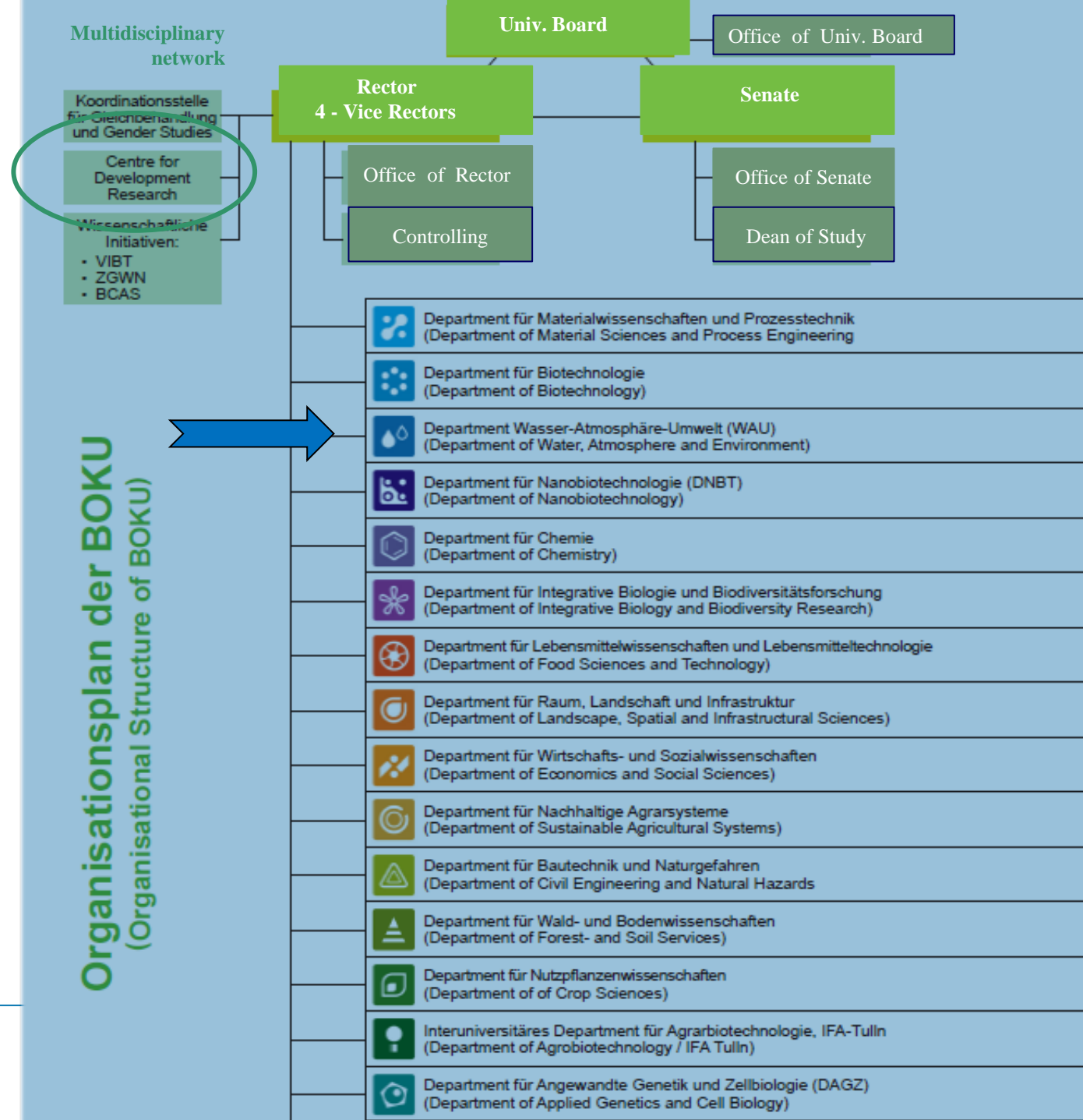
BOKU- experience

From “Diplomingenieur” to Bachelor / MSc

Environmental Engineering

Review and improvement of bachelor structure

# Structure of “BOKU”



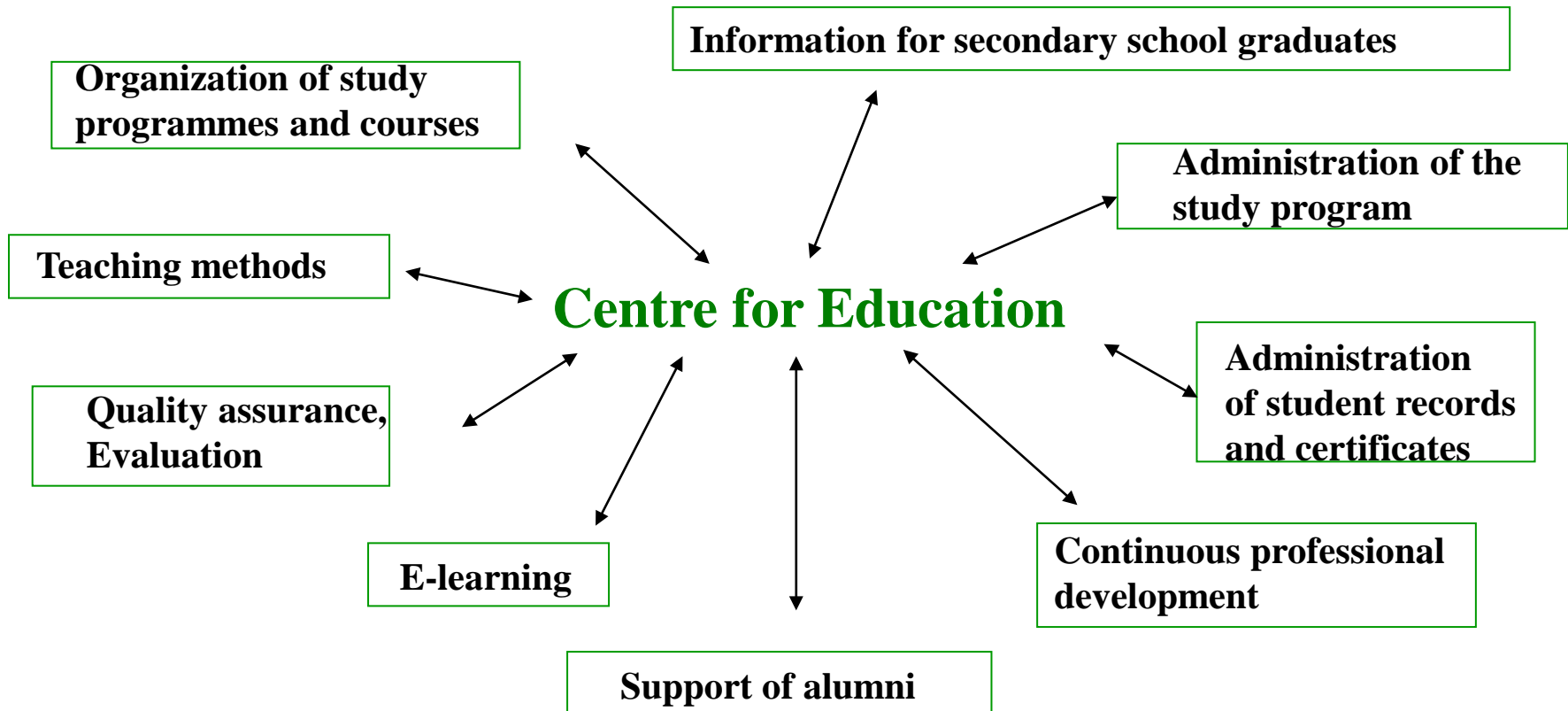
Founded 1872

1000 Scientists  
50% third party founded

1550 total personal

12.500 Students

# Structure of University Organisation - BOKU





## Structure of University Organisation - BOKU

- International office
  - ➔ platform for international activities
  - ➔ transmit information among different partner institutions, but also internally
- Establishment of quality assurance groups
- Strategy for the Internationalisation of BOKU

*From the BOKU Mission Statement :*

The BOKU professes to being an international performer in research and teaching, cooperating across national and international borders, and initiating open-mindedness towards new developments





## Introduction BOKU – Study Programmes

**Bachelor studies** (time-line: 6 semesters)

1<sup>st</sup> Degree: “Bachelor of technical sciences”

**Master studies** (time-line: 4 semesters)

a continuing program after the bachelor study 2<sup>nd</sup> Degree:

“Master of engineering”

**PhD studies** (time-line: 6 semesters)

Program which is offered for master program graduates.

Degree: “Doctor of Agricultural Sciences” (Dr. nat. techn.)

NEW: Doctorate of Social and Economic Sciences at BOKU

(Dr.rer.soc.oec)

**Further information:**    [www.boku4you.at](http://www.boku4you.at)



## Curriculum development at BOKU

Corner stones for education → Bologna declaration

- Comparable and transparent curriculum structure
- European Credit Transfer System (ECTS)
- Political decisions
- New partnerships and co-operations
  - national
  - international
  - global

EU - Programmes

e.g. TEMPUS support capacity building at higher education institutions

## Curriculum development at BOKU

From “Diplom-Ingenieur” to Bachelor / MSc

### **Frame for Bachelor – Master – System**

Total Duration ..... 210 Wh / Sem.      (before  $\approx$  250 Wh / Sem.)

Bachelor ..... min. 70% @ 147 Wh / Sem.

Master ..... max. 63 Wh / Sem.

Elective subjects ..... min. 10% @ 15 Wh / Sem.





# **BOKU experiences with curriculum development**



From “Diplomingenieur” to Bachelor / MSc

## **Frame for Bachelor – Master – System**

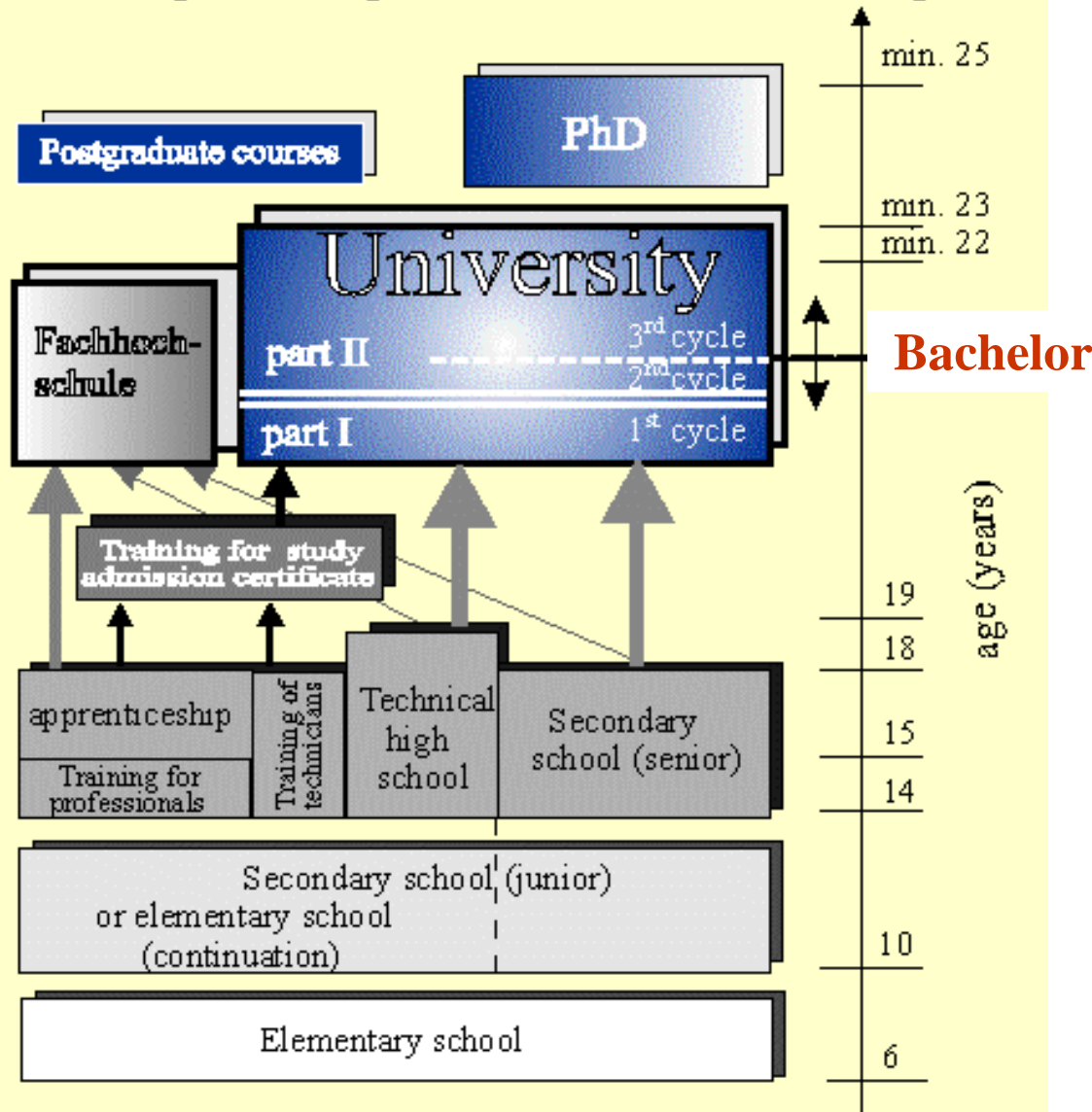
Total Duration ..... 210 Wh / Sem.

Bachelor ..... min. 70%  $\cong$  147 Wh / Sem.

Master ..... max. 63 Wh / Sem

Elective subjects ..... min. 10%  $\cong$  15 Wh / Sem.

# Education system in Austria related to engineering education and training



# Environmental Engineering

- was introduced in 1883 as a 3 years course for academic instruction on land improvement and reclamation (drainage, irrigation).

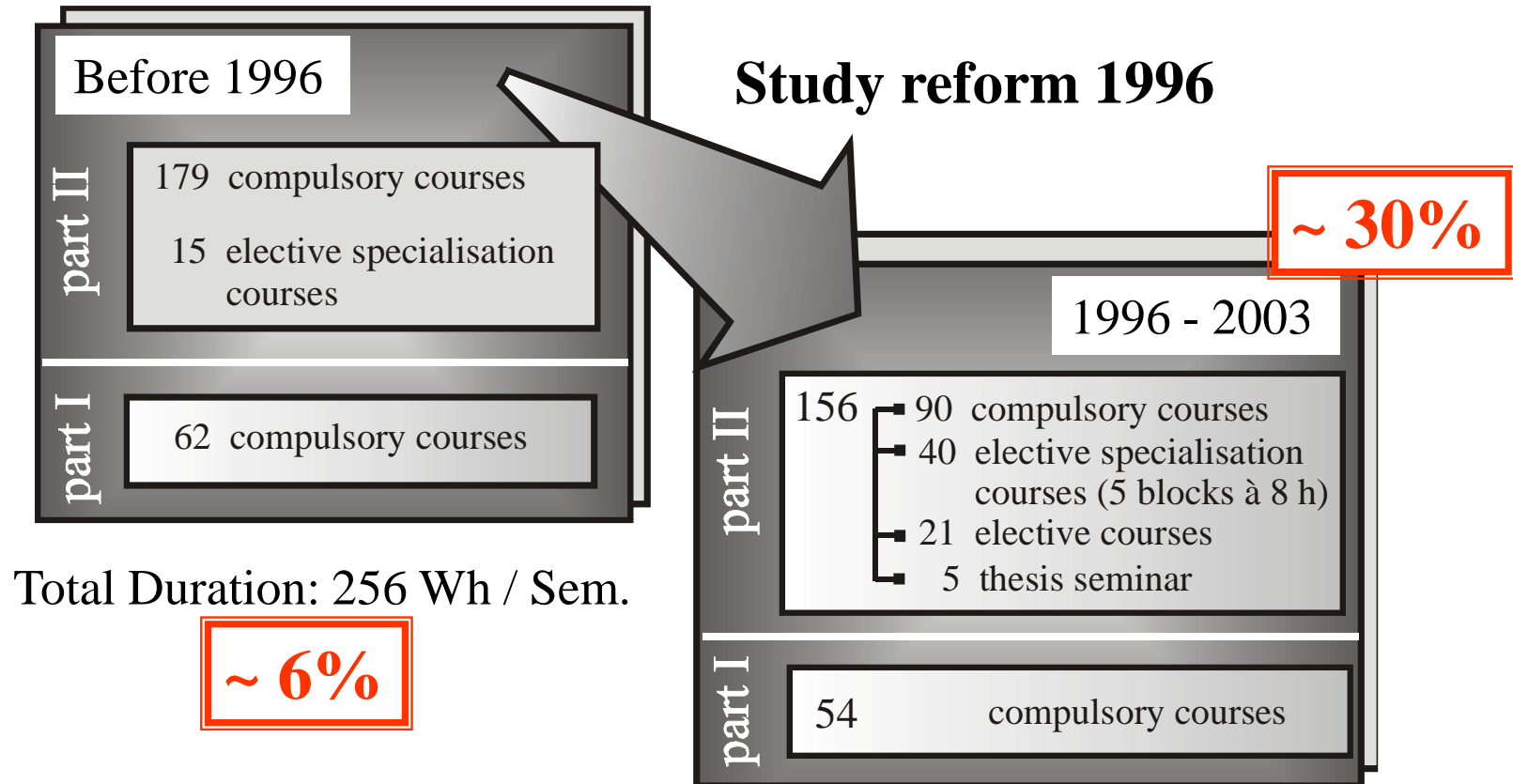
The field of activity was the rural (agricultural) area.

- is an applied technical orientated course with strong background on natural sciences and ecological empathy. This allows graduates to work at an interdisciplinary level in planning, implementing, supervising, maintaining and administrating engineering projects related to land and water management as well as waste disposal.

The field of activity is still the rural area but in close interrelation with the demands and special features of the urban area.

---

# BOKU – First steps to modularisation



Total Duration: 210 Wh / Sem. = 300 ECTS

# Study reform 2003



## Diploma Curriculum

### Pros

- Well known, accepted
- Balanced curriculum
- Distinct to curricula of competitors
- Broad range of professional topics
- Problem oriented approach

### Contras

- Limited compatibility with international programmes
- Lack of international recognition
- No graduation for drop out candidates
- Long study duration

## Bachelor - Master

### Pros


- Internat. Acceptance
- Comparable formal standards
- Stimulation of mobility
- Competitive to FH
- Bachelor graduation

### Contras

- Difficult a priori evaluation
- Unknown employers acceptance of Bachelor degree
- Non homogeneous Master programs
- Broad range of professional fields only with B+M

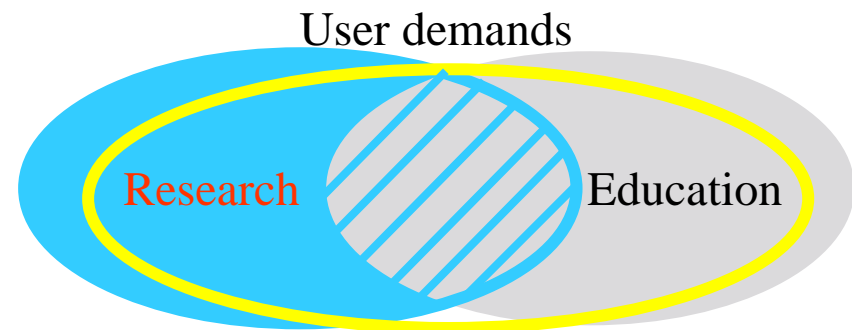
# Strategic approach

Starting point:

- Evaluation of development potential for new curricula  **Questionnaire**
- Analyses of internal und external factors of education environment
  
- Mission statement : BOKU advocates for research oriented education and learning (*The university takes part in generating the research topics which are reflected in education*)

# Strategic approach, education environment

- Strategic orientation of BOKU (areas of competences)
- Assessment of existing study programmes
- Requests from society
- Scientific development
- Employment requirements



- |                     |             |                                |
|---------------------|-------------|--------------------------------|
| • Expectations      | * Graduates | • Quality assessment           |
|                     | * Employers | • Needs for improvement        |
| • Market conformity | * Research  | • Adequate training facilities |
|                     | * Education | • New means of teaching        |
|                     |             | • etc.                         |

# Strategic approach, education environment

## Challenges of university education

- Theory vs. practice orientation
- Education vs. training (Employability)
- Academic Quality vs. Employability
- Study as education experience vs. Employability
- Research- vs. education scopes
- Academic liberty vs. societal responsibilities
- Tradition vs. Innovation
- Nationality vs. Internationality
- Disciplinary vs. Interdisciplinary






PROJECT – “BOKU studies in the future”


<http://www.boku.ac.at/projekt.html>

# Strategic approach

Starting point:

- Evaluation of development potential for new curricula  **Questionnaire**
- Analyses of internal und external factors of education environment
- Mission statement : BOKU advocates for research oriented education and learning (*The university takes part in generating the research topics which are reflected in education*)

# Present stage

 Strategic development of study curricula for a time horizon 2010 – 2015

- Development of new curricula
- Improvement of existing curricula

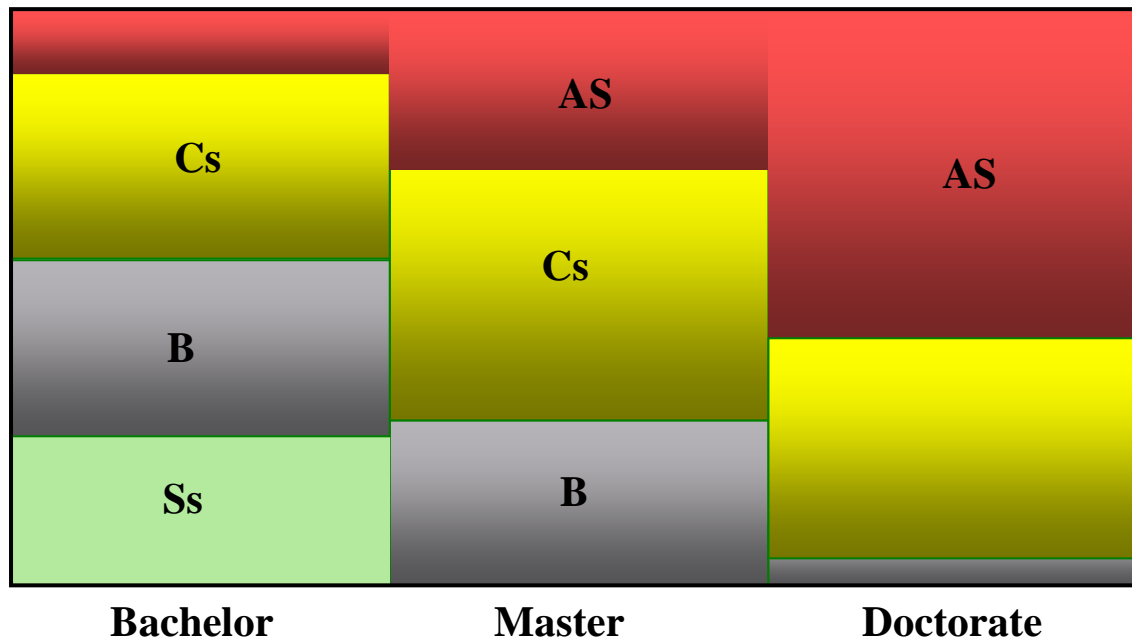
Existing programmes:

9 Bachelor – Studies

29 Master – Studies

11 in English  
6 joint programmes

# Consequences – study programmes



B = Basics

Ss = Soft skills

Cs = Curricula specific

As = Advanced specialisation

# Preparatory works

to obtain principles for strategic orientation of BOKU-Studies

## based on content criterias

- Natural science
- Engineering science
- Socio-economic science

## based on structural criterias

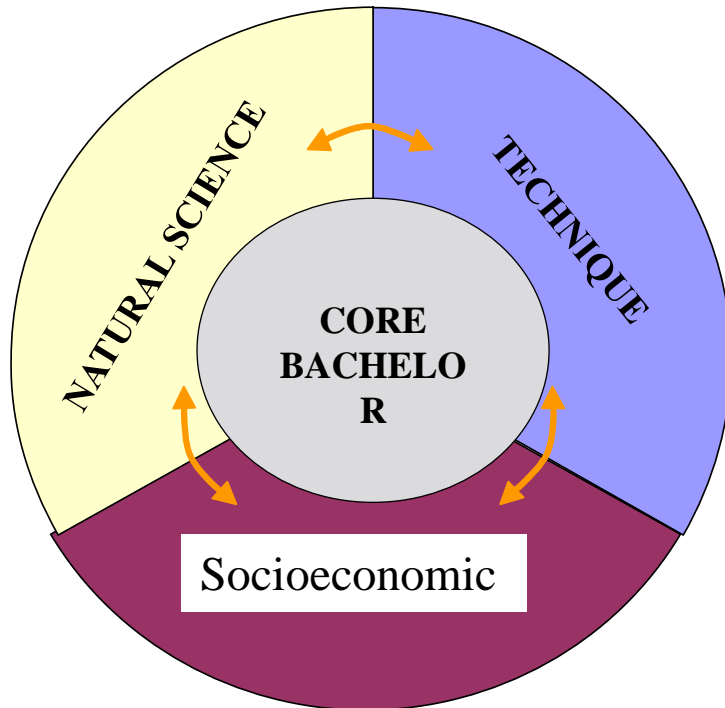
- Qualification profile
- Structure
- Type of lectures
- Compulsory and elective lectures
- etc.

## Guidelines for concept of BOKU-Studies – working groups

- Study goals and content
- Structure and model
- Degrees
- Mobility
- Internationalisation
- Teaching- und learning methods

# Agreed - principles

## 3-column model: Identity und Characteristic of BOKU-Studies



### **Bachelor:**

à 25% NASc, Technique, Socioeconomic

### **Master:**

à 15% NASc, Technique, Socioeconomic

# Agreed - principles

## Bachelor programme

- Science- and general basic oriented
- Conception oriented on BOKU-Master studies
- Job oriented and empowered

## High flexibility (mobility)

continuation from one bachelor to different master

## Modularisation

Creation of bigger lecture units

## Degrees

Master: According to orientation: Master (Magister) or Dipl. Ing

# Modularisation

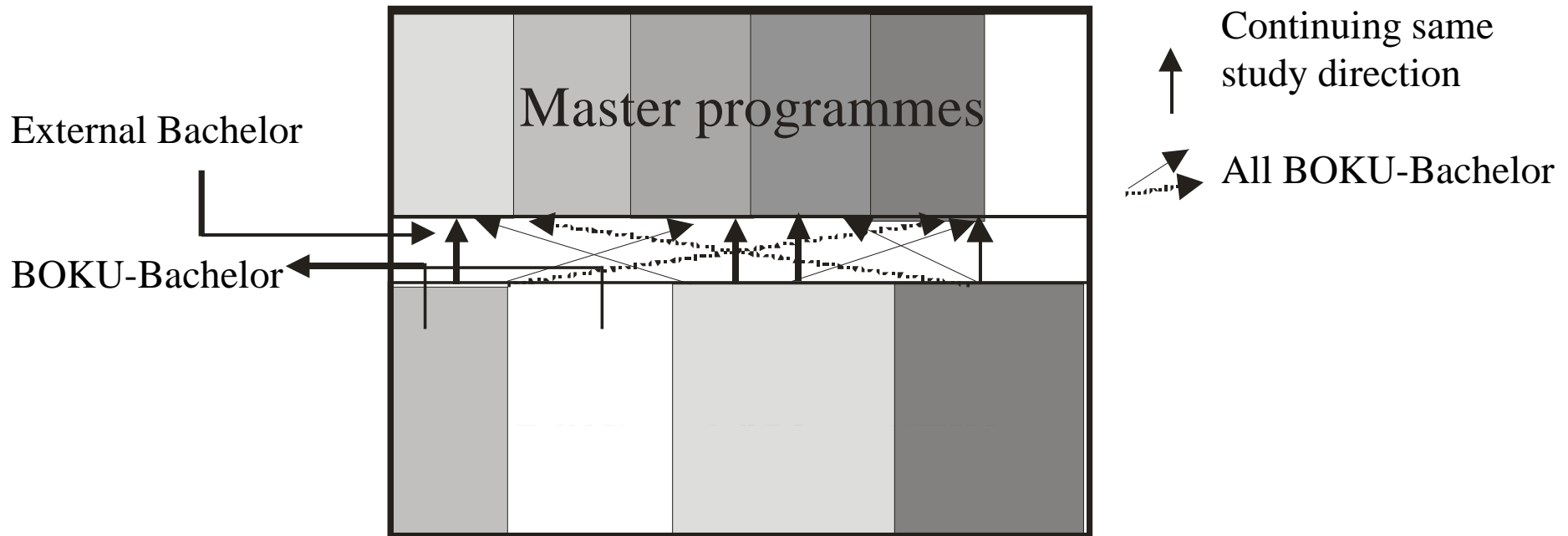
Module:

closed, formal structured learning process (according to Bologna declaration)

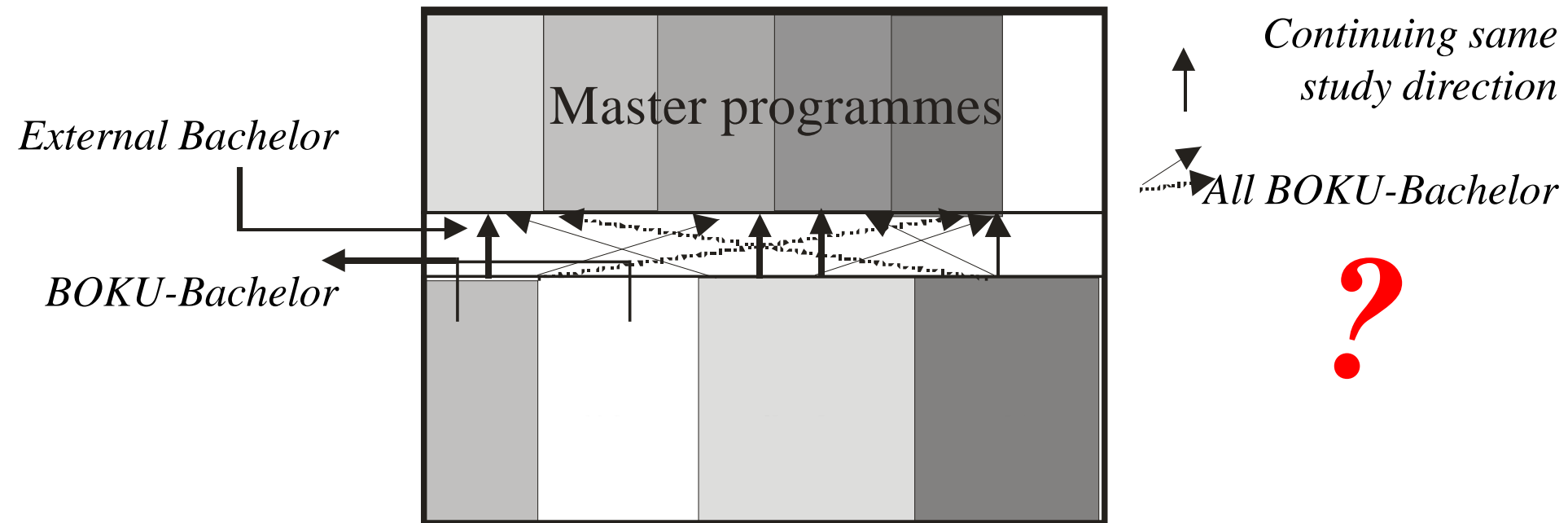
- thematic defined learning and teaching
- with defined, coherent learning outcomes
- defined workload of students (ECTS-Credits)
- unambiguous and transparent grading criterias



# Agreed – principles, Mobility



# *Agreed – principles, interchangeability*



# Modularised curriculum concept

## Bachelor

6 Semester 180 ECTS	Elective lectures 15 ECTS	
	Elect. specialisation 15 ECTS	Master specific
	Compulsory lectures	

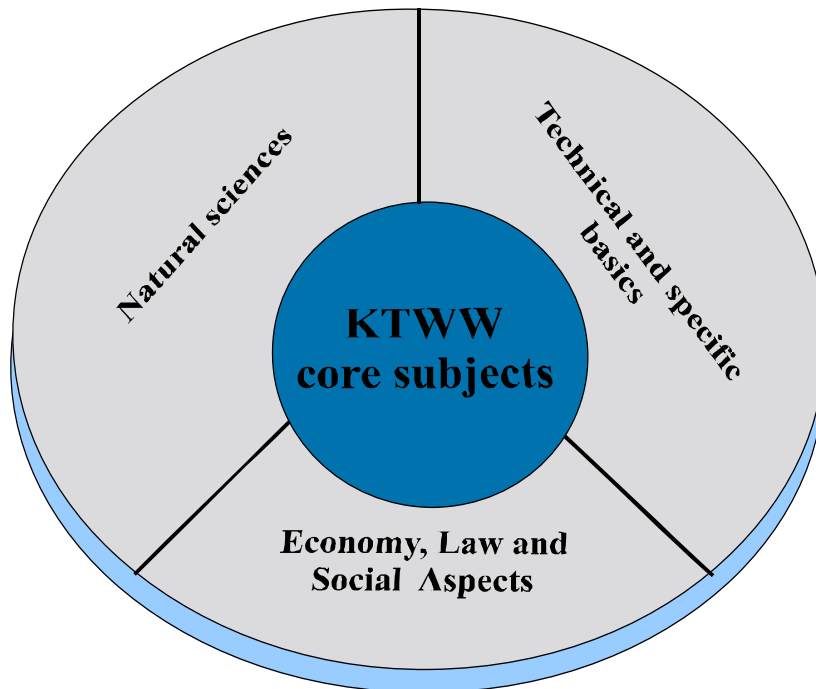
## Master

4 Semester 120 ECTS	Elective lectures 6 ECTS	
	M3	

## BOKU intern

### 3 Columns of Education

Identity and Characteristic of BOKU-Studies



#### **Bachelor:**

à 25% Natural Sciences, Technique,  
Socioeconomic

#### **Master:**

à 15% Natural Sciences, Technique,  
Socioeconomic

## BOKU master programmes in English 2014

- ⇒ Water Management and Environment Engineering (WMEE introduced 2011)  
Mountain Risk Engineering  
(merged with WMEE academic year 2011)
- ⇒ International Master of Natural Resources Management and Ecological Engineering (NARMEE)
- ⇒ Environmental Sciences – Soil, Water and Biodiversity
- ⇒ Limnology and Wetland Management

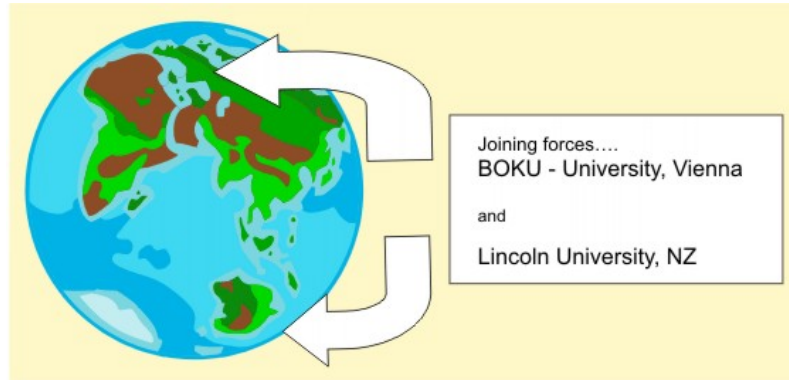


## **BOKU master programmes in English 2014**

- ➡ **Master Mountain Forestry**
- ➡ **Master Sustainability in Agriculture, Food Production and Food Technology in the Danube Region**
- ➡ **Master Safety in the food chain**
- ➡ **Master DDP Msc European Forestry**
- ➡ **Master DDP European Master in Animal Breeding and Genetics (EM-ABG)**
- ➡ **Master Organic Agriculture Systems and Agro-ecology (EUR-Organic)**
- ➡ **Master Horticultural Sciences**



# International



## Global Partnership

Two universities — one in the northern and one in the southern hemisphere — have joined forces to produce an innovative Masters degree.

### Why this degree?

In a world of increasing internationalisation, individual nations are increasingly extending and inter-penetrating their environmental impacts and 'ecological footprints .....

### What is it?

The 'Master of Natural Resources Management and Ecological Engineering' (NARMEE) is a two-year Masters combining both examination and thesis. Students are required to study at both places, and will finish with a jointly-awarded degree.



## EUROLEAGUE FOR LIFE SCIENCES



### Specialisations

Specialisations	BOKU	UHOH	KVL	SLU
Water Resources	X			X
Environmental Impacts		X	X	
Soil Resources and Land use	X	X	X	X
Ecosystems and Biodiversity	X			X
Environmental Management		X	X	
Climate Change	X	X	X	X

Each university has three fields of specialisation, requiring that the university offer ASPs within each of these.



# Student mobility



Student exchange requires **European Credit Transfer System - ECTS**

Credits represent workload

Credits not to be confused with grades



## **ELLS - Conference**

Internationalisation and Quality Assurance

Working Groups:

Joint curricula: challenges for the institutions and for students

Facilitating student mobility

# Life Long Learning LLL Austria

## Legal Framework

LLL: 2020 - Strategy for Life Long Learning Austria

- 4 Basic Principles
- 5 Strategic Guidelines
- 8 Key Competences

### *Publishers*

- Ministry of Education, Arts and Culture
- Ministry of Science and Technology
- Ministry of Labour and Social Affairs
- Ministry of Economy, Family and Youth

# Life Long Learning (LLL) Austria



## 4 Basic Principles

- Gender and Diversity
- Equal Chances and Social Mobility
- Quality and Sustainability
- Performance and Innovation

## 5 Strategic Guidelines

- Life Phase orientation
- Apprentice is the centre
- Life Long Guidance
- Competence orientation
- Participation support

## 8 Key Competences

- Competence in mother tongue
- Competence in foreign languages
- Competence in Mathematics and Natural Sciences
- Competence with Computer
- Learning Competence
- Competence in interpersonal, intercultural and social interaction
- Enterprise Competence
- Cultural Competence



## **BOKU Life Long Learning**

### **BOKU Implementation Procedure**

- Departments suggest LLL-Activity
- Senate develops Quality Assurance
- Office of Rector approves LLL-Activity

### **BOKU Implementation Guidelines**

- Self-financing
  - Provision of professional and work-related extra qualifications
  - Relevant to society
  - Belonging to one of four categories (*cf. next slide*)
-



## BOKU Life Long Learning

### **Category I:**

- 90 ECTS
- Finally certified:  
Master of ...  
(e.g. Business Administration)

### **Category II:**

- 60 ECTS
- Academically certified ...  
(e.g. Academic Estate Manager)

### **Category III:**

- < 60 ECTS
- Summer Schools, Seminars
- With course assessment

### **Category IV:**

- < 60 ECTS
- Summer Schools, Seminars
- With certificate of attendance
- Without course assessment

## **BOKU Life Long Learning**

### **Category I: (3 Courses)**

- MBA in Sustainable Development and Management
- MBA in Environmental Management
- MEng NanoBiosciences & NanoMedicine

### **Category II: (3 Courses)**

- Academic hunter
- Academic Course: Media naturae
- ULG Ländliches Liegenschaftsmanagement

### **Category III:**

- Summer schools – Euroleague – EU  e-learning

### **Category IV:**

- Univ.-Kurs Bleichen in der Papierrestaurierung



# Contact

Department of Water, Atmosphere and Environment  
Institute of Hydraulics and Rural Water Management

Department für Wasser – Atmosphäre – Umwelt  
Institut für Hydraulik und landeskulturelle Wasserwirtschaft

Willibald Loiskandl  
Muthgasse 18, A-1190 Wien, AUSTRIA  
Tel.: +43 1 47654 5451, Fax: +43 1 47654 5499  
Willibald.Loiskandl @boku.ac.at

<http://www.boku.ac.at/projekt.html>

**Thank you for your attention**



**Tempus Project: QANTUS**



# **BOKU Experiences with Implementation of Bologna Process Part II**

**Willibald Loiskandl**



## 3 – level education

### Bachelor – Master – PHD System

Corner stones for education → Bologna declaration

- Comparable and transparent curriculum structure
- European Credit Transfer System (ECTS)
- Political decisions
- New partnerships and co-operations
- national
  - international
  - global

EU - Programmes

e.g. TEMPUS support capacity building at higher education institutions

# Prerequisites for comparison

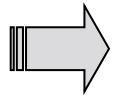
Credits represent **workload**

Credits **not** to be confused with **grades**

Additional

- ETCS is the **European Credit Transfer System**
- ETCS is a tool for **harmonisation** — not homogenisation
- ETCS is a programme from **SOCRATES**
- ETCS serves the **mobility** in Europe

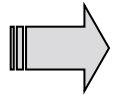
## Characteristic that make ECTS work



Transparency

Information Package

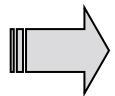
Transcript of Records



Agreement

Learning Agreement

Programme of Study Agreement



Credits

One academic year = 60 Credits

# European dimension, Student mobility

## How to encourage students?

- Mobility grants
- Full recognition of work done abroad
- Full implementation of ECTS
- Local job market acceptance
- Work abroad
- Language skills
- Participation in courses taught in a foreign language (technical) required
- Information, Dissemination, Marketing

# Present Bachelor Curricula

Summary: Bachelor programme structure BOKU 2006

- Admission: issued by rector (vice rector of education)
- **6 Semester**
- Compulsory courses 148 ECTS
- Bachelor Thesis (Interdisciplinary Work) 12 ECTS
- Free elective courses 15 ECTS
- Compulsory Practical training 5 weeks 5 ECTS
- Total 180 ECTS

- BOKU (**1 Bachelor programmes Environmental Engineering**)

# Present Master Curricula

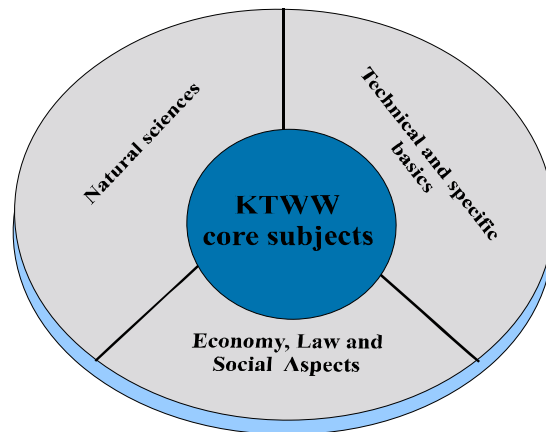
Summary: Master programme of BOKU 2006

- Admission: issued by rector (vice rector of education)
- **4 Semester**
- Compulsory courses 20 ECTS
- Elective courses 64 ECTS
- Free elective courses 6 ECTS
- Master thesis 30 ECTS
- Total 120 ECTS
  
- Compulsory Practical training 4 weeks
- BOKU (2 master programmes Environmental Engineering and Water & Environment  
Related international programmes NARMEE and EnvEuro)

*BOKU homepage <http://www.boku.ac.at/1903.html>*

# Bachelor and Master Programmes at BOKU related to the IHLW

- Environmental Engineering } Bachelor Programme
- Environmental Engineering (KTWW in German)
- NARMEE (in Engl.)
- Water Management and Environmental Engineering (in Engl.) } Master Programme
- International Course in Environmental Management and Ecological Engineering – ENVEURO (in Engl.)



## 3 Pillars of Education

Identity and Characteristic of BOKU-Studies

### Bachelor:

à 25% Natural Sciences, Technique, Socioeconomic

### Master:

à 15% Natural Sciences, Technique, Socioeconomic

## Qualification - Curriculum of Master degree at BOKU

The Master degree programme in Environmental Engineering allows students to consolidate their knowledge of the areas and working practices within the applied sciences and their engineering-related applications.

This degree programme aims to enable mankind's use of natural resources.

For this professional training, a good basic scientific knowledge is required, in addition to a comprehensive understanding of the sustainable use of resources and a logical mind for responsible planning, design, construction and maintenance.



## Qualification - Curriculum of Master degree at BOKU

Water management aims to sustainably use and secure water as a resource. It is therefore caught in an area of tension between economic and ecological aims.

An understanding of the hydrological cycle is the foundation of water management measures. The many functions of the natural potential of water interacting with the soil should be optimally and uncompromisingly used, protected and, as a basic foundation of life, be secured sustainably.

It is becoming even more difficult to provide water in adequate amounts, but also of adequate quality. The consideration of extremely complex ecological connections and interactions is becoming even more important in this respect.

## Qualification - Curriculum of Master degree at BOKU

In areas of water and soil, following subjects will be researched and extensively taught:

- hydrology,
- water management planning,
- constructive hydraulic engineering and river management,
- cultural water and groundwater management,
- settlement water management,
- industrial water management and
- water protection,
- hydrobiology and
- water ecology,
- waste management.

## Qualification - Curriculum of Master degree at BOKU

Graduates of the Master degree in Water Management are expected to have the necessary knowledge of administration and management to be successful in their work.

The importance of communication, coordination and leadership abilities, without which, successful work (both within a team and as an individual) is not possible, is emphasised during the university course.

Mobility, foreign language acquisition and internationality are increasingly important qualification criteria for graduates of the Master degree in Environmental Engineering, and are therefore specifically promoted through the three-tier education system (which corresponds to international norms).

## Admission - Curriculum of Master degree at BOKU

Graduates of the Bachelor degree in Environmental Engineering from the University of Natural Resources and Life Sciences, Vienna, will be admitted to the Master degree programme.

Graduates of other Bachelor degrees who wish to take the Master degree in Environmental Engineering must be able to demonstrate a fundamental, equivalent knowledge of the central subjects taught as part of the Bachelor degree in Environmental Engineering.

Specifically, this concerns the subjects taught as part of the Bachelor degree in Environmental Engineering in the areas of scientific basics, the technical and subject-specific foundations, the social, economic and legal courses, and the vocational compulsory modules (central to civil engineering)

# Present Doctoral Curricula

Summary: Doctoral programme of BOKU 2006

- Admission: issued by rector (vice rector of education)
- **6 Semester**
- Minimum of 180 ECTS, including at least 20 ECTS doctoral courses and at least 160 ECTS for the dissertation
- Registration requirements:
  - Doctoral thesis topic
  - Name of advisor
  - A work schedule approved by the advisor including:
    - **Advisory team**
    - **Time schedule** and **resource plan**
  - Proposal for doctoral courses (**approved by Dean**)

- 20 ECTS examination record;
- **Thesis: 2 Reviewers ≠ Advisor**  
Defence of Thesis (examination board: chair + examiners)



## E- Learning BOKU

### **BOKU learn - MOODLE**

MOODLE (Modular Object Oriented Dynamic Learning Environment) is used as e-learning platform at BOKU.

BOKU learn was launched in September 2005.

BOKU e-Learning Centre is an integral part of teaching at BOKU.

BOKU e-Learning Centre is embedded in the Center for Education and interlinked with many other BOKU institutions.

---

*Source: <http://www.boku.ac.at/e-learning-leitbild.html?&L=1>*

# E- Learning BOKU



Moodle.org: open-source community-based ...  
https://moodle.org/?lang=en

moodle

About News Support Community Development Do

Welcome to the Moodle community!

Moodle is a Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It is a Free web application that educators can use to create effective online learning sites for their institutions.

Moodle.org is our community site where Moodle is made and discussed. Please use the menu to explore and join in!

moodle.com  
installation  
support  
hosting

You are not logged in. (login)

software package for producing Internet-based courses and web sites (Open Source!!!)



BOKU learn - Die Lernplattform der Universit...  
https://learn.boku.ac.at/?lang=en

BOKU learn

Start my BOKU learn Calendar Messages FAQ Su

Latest news

27 Nov 15:35

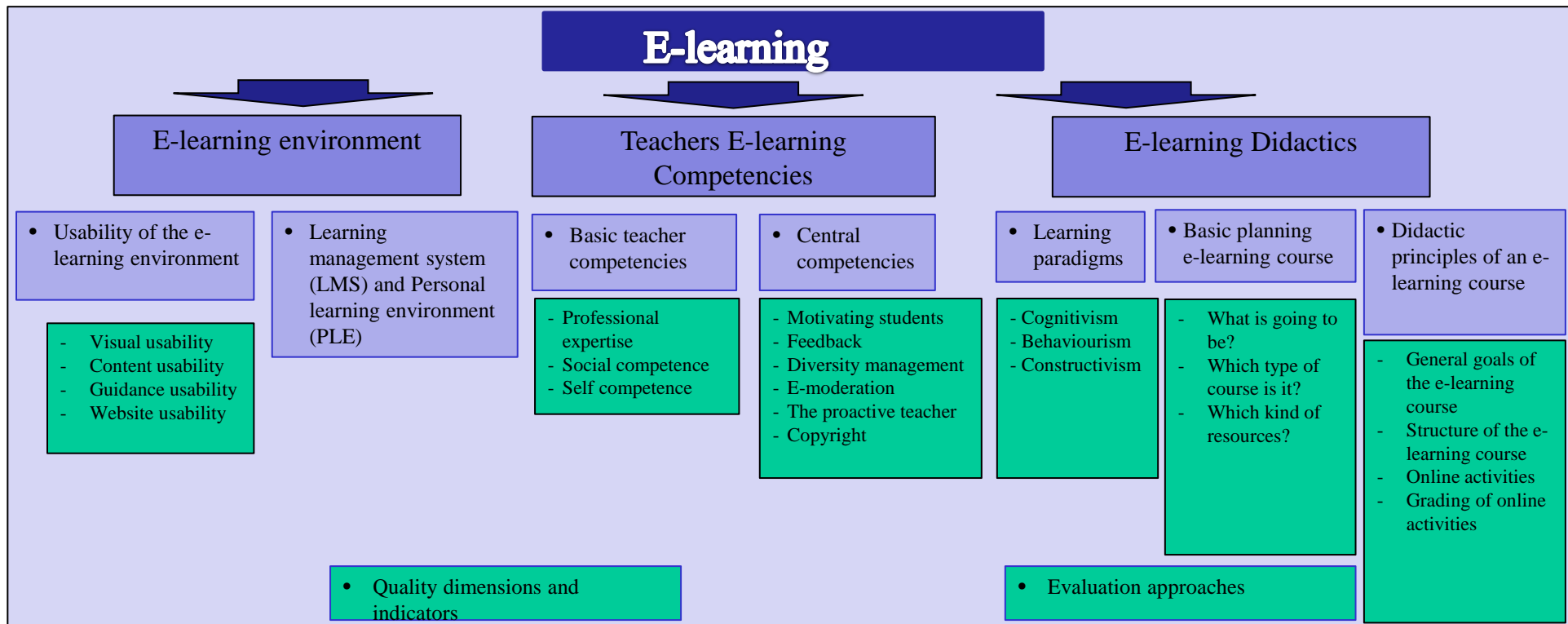
You are not logged in. (Login)  
English (en)

BOKU's Moodle based virtual learning environment

# Characteristics of good E-Learning



## Evaluation of E-Learning





# Impact on universities? During transition and permanently



ELLS – Conference: Internationalisation and Quality Assurance

University	Academic staff	Administration	Students
Bologna International offices Co-operation vs. Competition Market presence Increase of competence Acknowledge time for changes Extra costs? Incentives, investment in future	Language New partners Collaboration Sharing of teaching material Expertise exchange New teaching methods Changes of thinking Cultural diversity Mobility and training Extra work , incentives	Language ECTS Flexibility Mutual trust International contracts Extra work	Language Different environment Broaden mind/ Specialising Integration International jobs Make new friends Lifelong experience Continuing education
European	European	European	European

Life is a dynamic process and as defined by eschatology it is heading in the direction for the better (Teilhard de Jardin)





## Specific goals of SP-I Teaching Resources



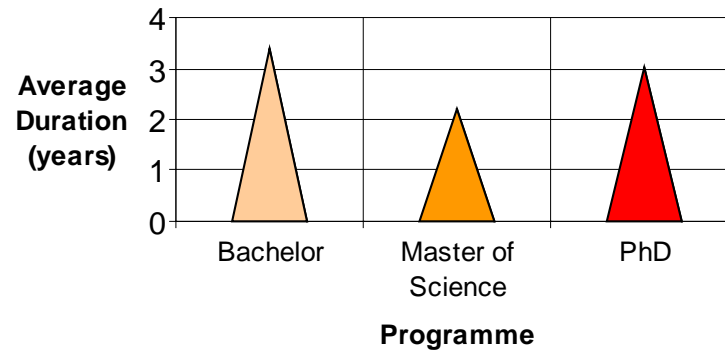
- Adequate research-oriented teaching resources
  - Non-academic community involvement and technology transfer
  - European dimension
  - Measures for student involvement in research
  - Continuing education in the water sector
  - New research-based resources
-

# European dimension



Bologna process

Duration of several Programmes



Duration of BSc-MSc-PhD

Longer study → liberal and flexible curriculum

Shorter study → stringent time schedules (fixed examination periods, continuation requirements etc.)

# Background information of ETNET21 partners



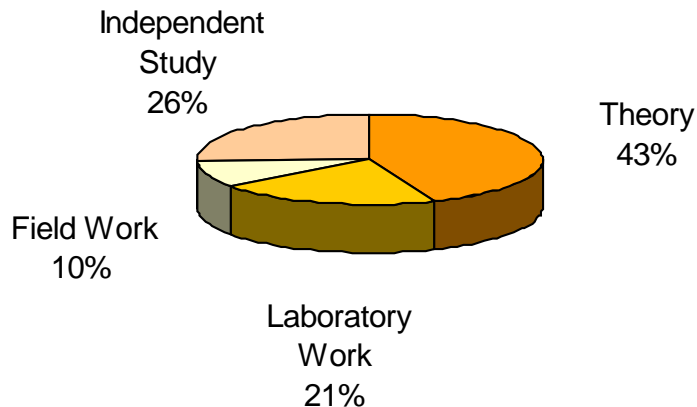
Generic titles of programmes offered by ETNET21 partners



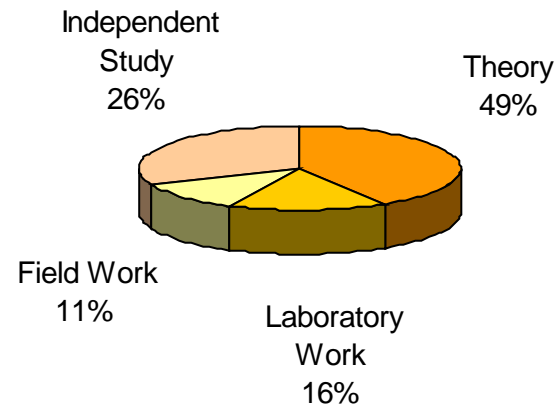
Civil engineering	Water resources management	Soil	Environment	Others
11	28	5	10	6

Water and environment related courses show the expertise present within ETNET21

**WORKLOAD OF BACHELOR**



**WORKLOAD OF MASTER OF SCIENCES**

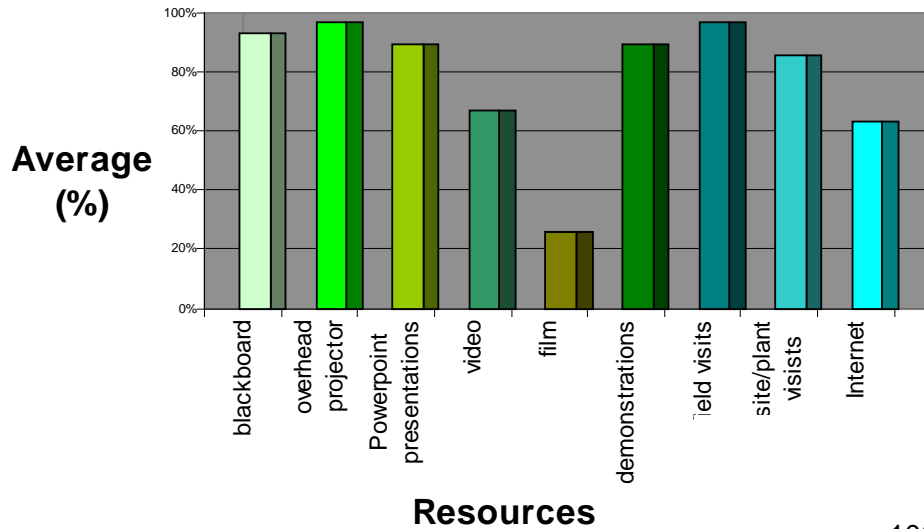


- At present it is not advised to treat bachelor and MSc-programmes separately
- no recommendations for future development were given.

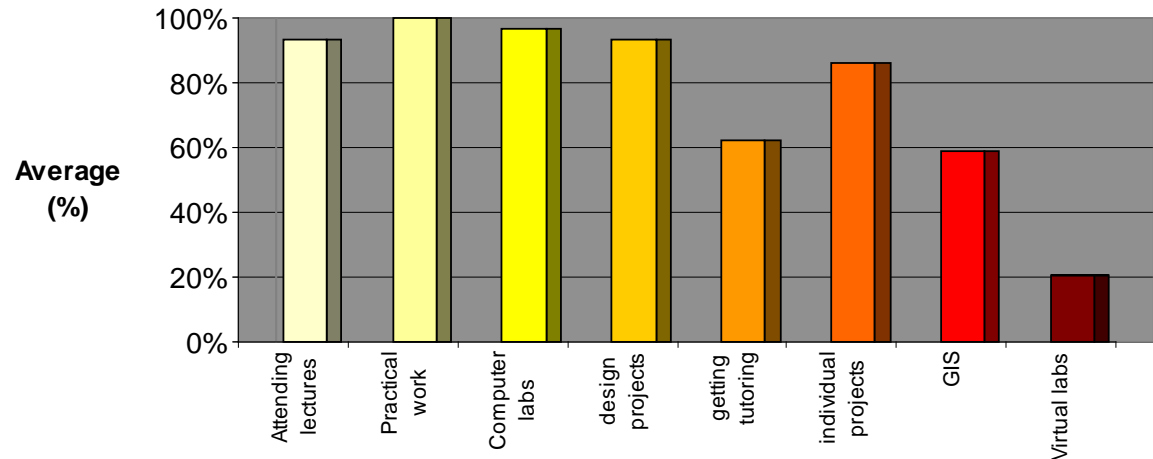
# Teaching resources and methods



Sharing teaching resources



## STUDENT ACTIONS

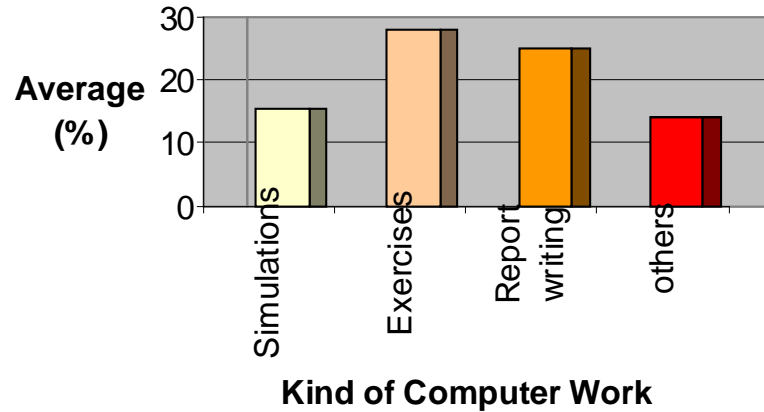


- Traditional actions as well as computer works are standard
- Virtual laboratories have the biggest development potential

# Teaching resources and methods

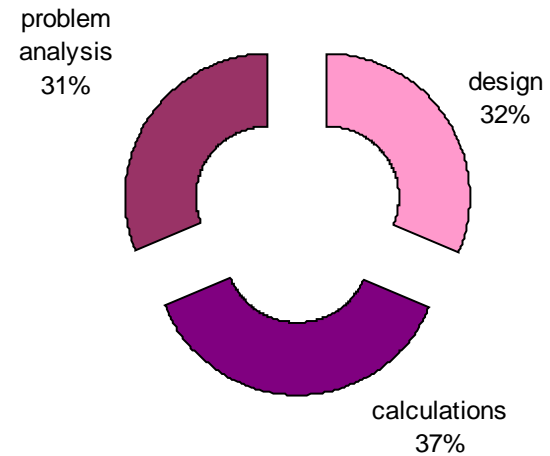


## COMPUTER WORK



## Student activities

### KIND OF PROJECT WORK

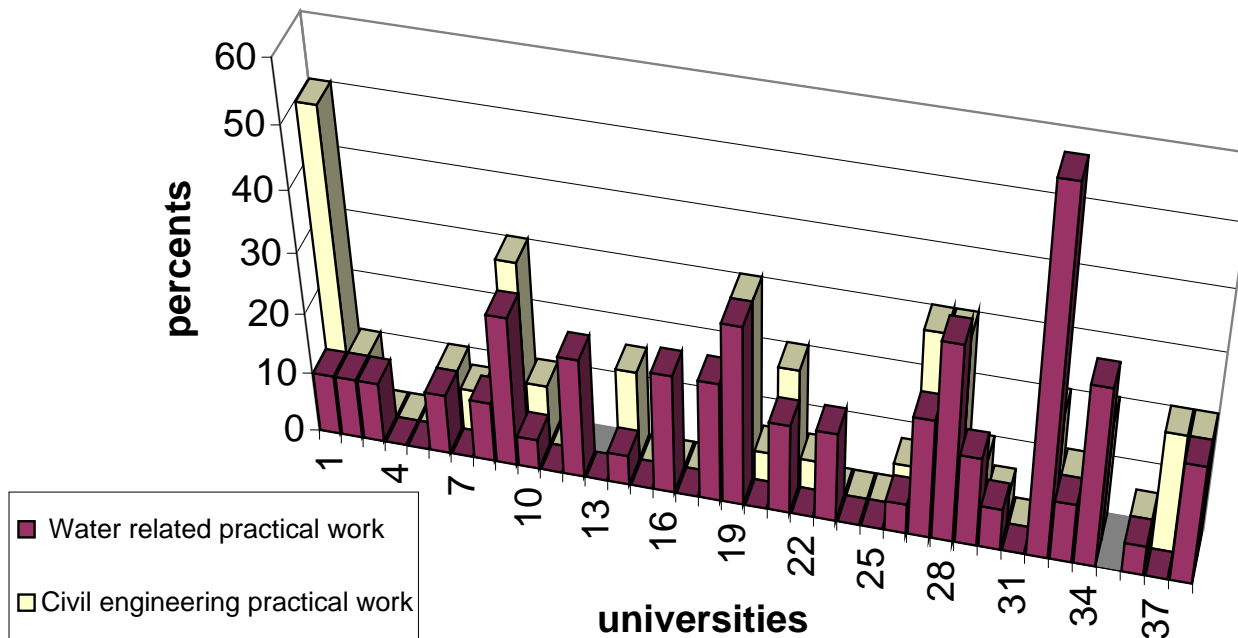


- Main topics related to water sciences
- Skills like data analyses and GIS

# Teaching resources and methods



## workload of practical work



Average water related practical work = 15 %

Average civil engineering related practical work = 16 %

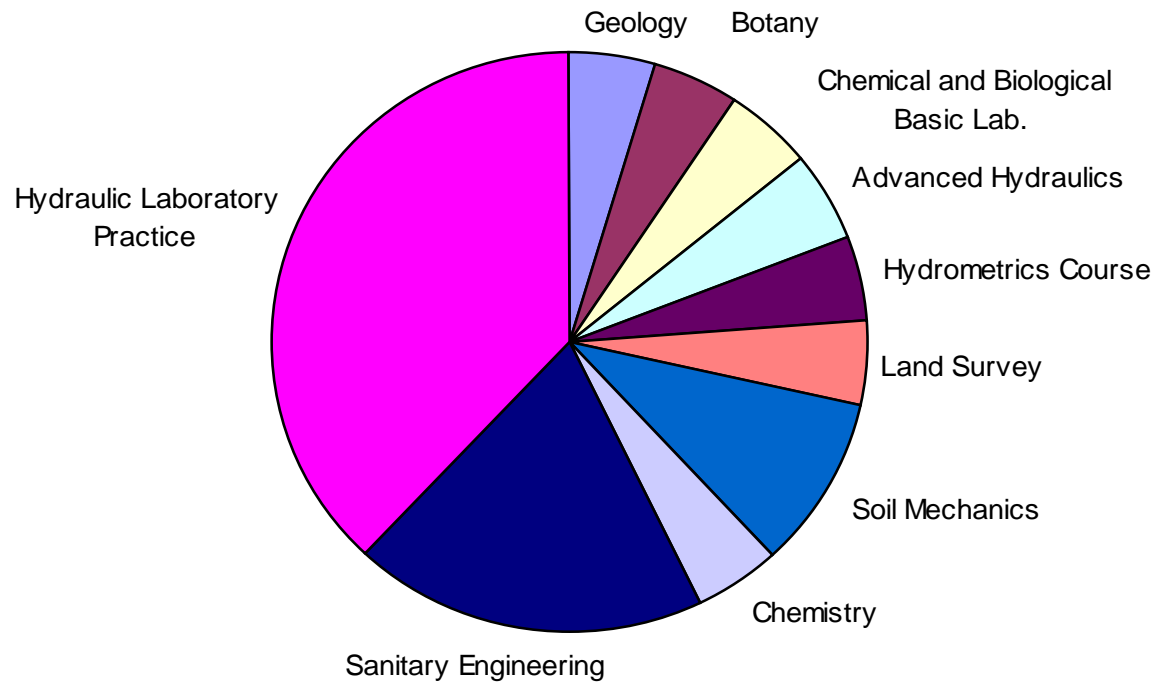


# Teaching resources and methods

## Ranking of courses involving practical work



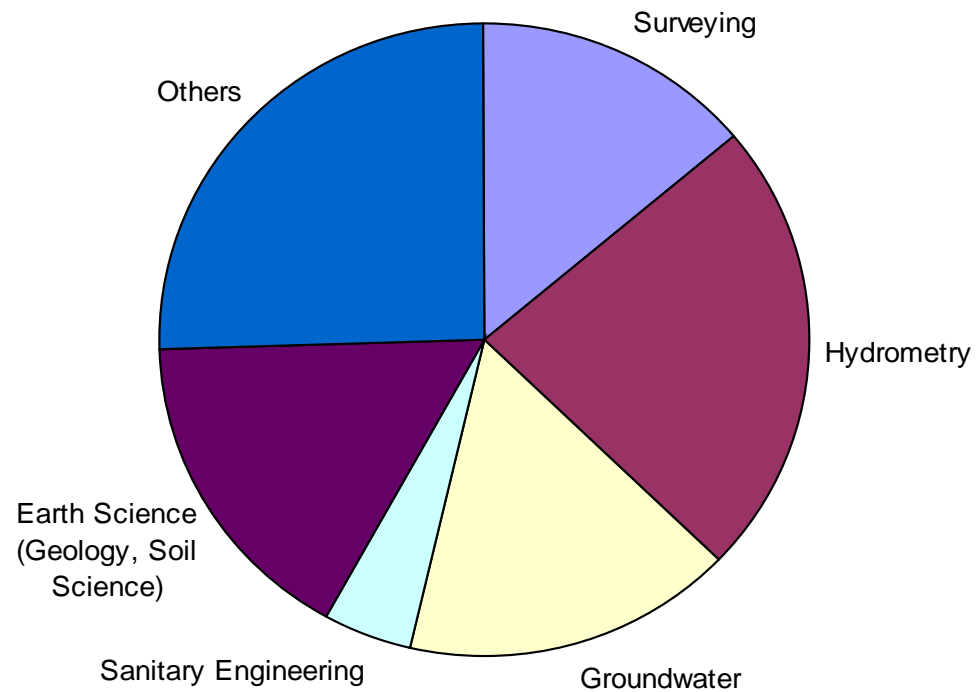
courses including practical work



# Teaching resources and methods

## Kind of field works

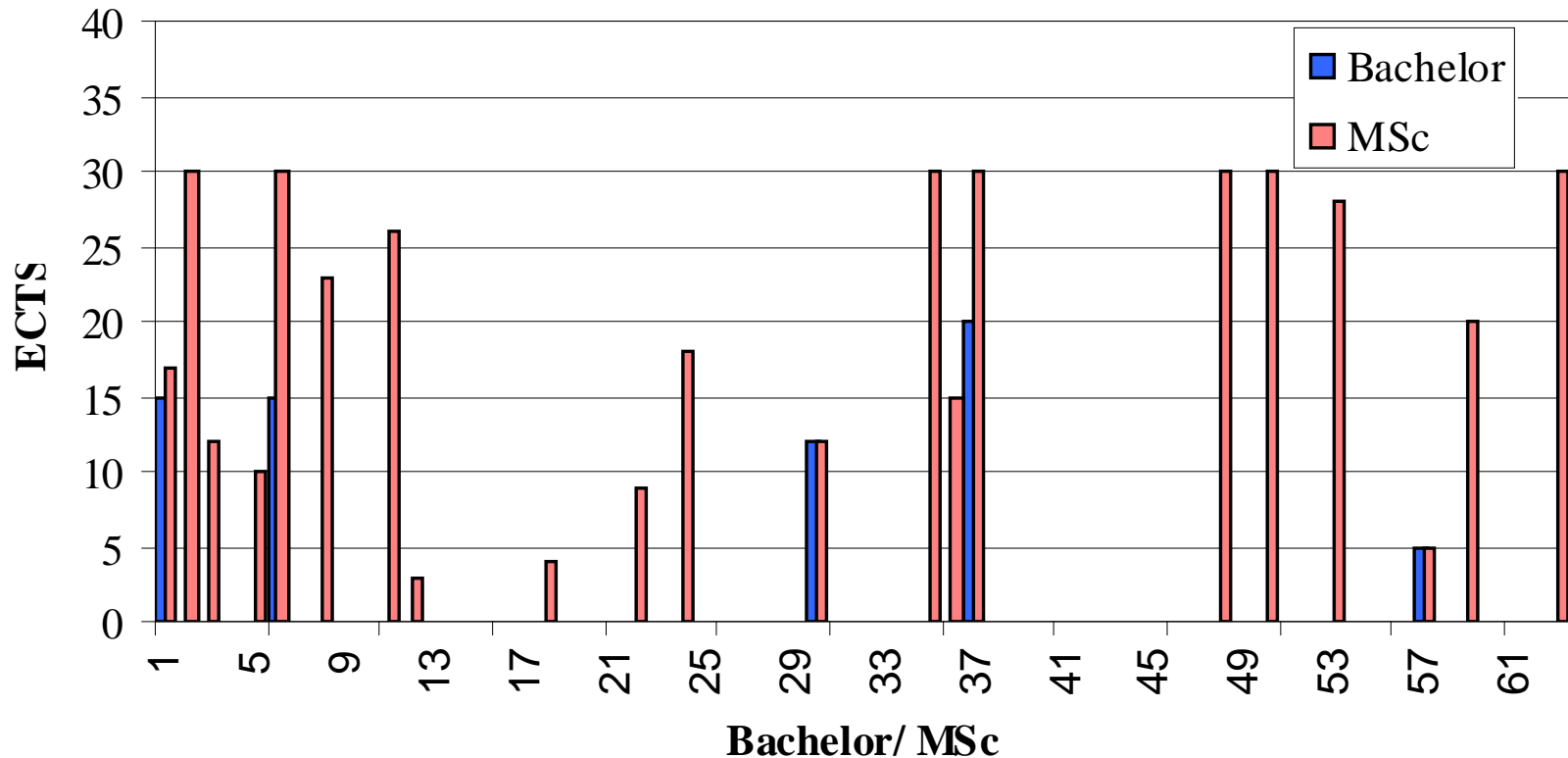
### courses including fieldwork



# Teaching resources and methods



**Final thesis is part for all programmes !**



Thesis ECTS-Allocation

# Teaching resources and methods



## Involvement of students into research

