

# Forest high education programs implemented at Forest Faculties in selected Western and North European countries

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ARTICLE

## Abstract

The study presents the assumptions and content of studies on eight forest faculties in selected Western and North European countries. Entering a two-level system based on the Bologna Process resulted in unification of diplomas, their names and rank. In most faculties at the undergraduate level (lasting 6 semesters) there was one specialization and at the graduate level (lasting 4 semesters) several specializations (some conducted only in English). Such study organization existed at the Faculty of Forestry and Environmental Sciences at the University of Freiburg. A slightly different approach (more specializations at I and II level, including some loosely associated with forestry) existed at the Faculty of Forestry and Soil Science at the University of Life Sciences in Vienna. The future of forest education is perceived in co-operation between faculties.

**Key words:** The Bologna Process, specjalty, level of study, university

## Streszczenie

Celem opracowania było przedstawienie generalnych założeń i treści programów na leśnych studiach I i II stopnia na ośmiu wybranych wydziałach leśnych w państwach Europy Zachodniej i Północnej oraz szczegółowych założeń i programów na przykładzie dwóch wydziałów (Freiburg, Wiedeń). W okresie 1990-2004 na wydziałach leśnych dokonywano reform studiów i programów, ale początkowo bez koordynacji na szczeblach krajowych czy międzynarodowych. W roku 2004 zakończono wprowadzanie systemu dwustopniowego na podstawie tzw. Procesu Bolońskiego. Spowodowało to ujednoczenie dyplomów, ich nazewnictwa i rangi (po studiach I stopnia tytuł Bachelor, a po studiach II stopnia Master). Na większości wydziałów, na studiach I stopnia (trwających 6 semestrów) istniała jedna specjalność, a na studiach II stopnia (trwających 4 semestry) kilka specjalności - przy czym niektóre prowadzone wyłącznie w języku angielskim. Taka organizacja studiów istniała na Wydziale Leśnym i Nauk o Środowisku w Uniwersytecie we Freiburgu. Leśnictwo na I stopniu studiów było nauczane na jednej specjalności („Leśnictwo i Środowisko”), a na II stopniu na trzech - przy czym żadna nie była wprost kontynuacją specjalności wcześniejszej („Nauki Leśne” i w języku angielskim: „Ekologia i Gospodarka Leśna”, „Leśnictwo Europejskie”). Inna organizacja istniała na Wydziale Leśnym i Gleboznawstwa w Uniwersytecie Przyrodniczym we Wiedniu. Były tam trzy specjalności na studiach I stopnia (jedna związana bezpośrednio z leśnictwem - „Nauki Leśne”) oraz sześć specjalności na studiach II stopnia (trzy związane bezpośrednio z leśnictwem „Nauki Leśne”, „Ekologia i Gospodarowanie Zwierzyną” i w języku angielskim „Leśnictwo Terenów Górskich”). Przyszłość kształcenia jest dostrzegana w kooperacji między wydziałami, bo nie każdy uniwersytet może oferować wszystko, co jest potrzebne przyszłym leśnikom.

## Introduction

Teaching of forestry in higher (university) education has changed radically in the period from around 1990. One reason was the introduction of so-called the Bologna Process, which began in 1999 after signing the Bologna Declaration by 29 European Ministers of Education. Countries participating in the Process agreed to harmonize university studies and introduce a common system of the study evaluation (credits) and qualifications.

At the same time forestry in Europe began to experience significant changes. Its economic importance was decreased (raw materials and profitability) but on the other hand the importance of the natural aspect of the forests, their social and cultural functions increased. Additionally changes in the profitability of forest holdings and organizational and administrative modifications caused a decrease in demand for forestry graduates. All those factors, occurring relatively quickly, had influence on the transformation of forest higher education. For that reason, only a few years after the introduction of the Bologna Process, studies aimed to assess forest curriculum were undertaken (Schuck 2009).

The purpose of this paper is to present general principles and content of programs for forestry education on the 1<sup>st</sup> and 2<sup>nd</sup> level of degree. The analysis will be presented on the example of a few selected faculties in Western and Northern European countries ie. Germany (Freiburg, Göttingen, Munich, Dresden), Austria (Vienna), the Netherlands (Wageningen), Finland (Helsinki, Joensuu). Additionally, the aim was to provide detailed guidelines and forestry education programs, including examples from the faculties in Freiburg and in Vienna. The study done by Schuck (2009) and materials available on the Internet were applied as the source material.

## Similarities and differences between forest faculties

Differences between compared faculties show up already at the stage of examining the names of educational units where university forest education is organized. Those include Universities (Freiburg, Göttingen, Helsinki, Joensuu), Agricultural University (agronomic, landowners), now changed into the University of Life Sciences (Vienna, Wageningen) or Universities of Technology (Tharandt, Munich). In addition, the internal structures of universities differ. Thus, teaching forestry takes place on faculties, in schools, at study faculties or in departments (tab. 1). But the introduction of the Bologna Process has resulted in harmonizing diplomas and now after the 1<sup>st</sup> education level (undergraduate course) students obtain the degree of a Bachelor (BSc, engineer) and after the 2<sup>nd</sup> education level (graduate course) students obtained the degree of a Master (MSc, master). Hence the problem of differences between names and ranks of diplomas at different Universities disappeared.

According to Schuck (2009) over the period of 1990-2004, analyzed forest passed organizational changes. The most important ones were as follows:

- Helsinki (1993) connection of all faculties and departments into three units (forest resource management, forest ecology and forest economics),
- Wageningen (2000) Wageningen Agricultural University renamed to Wageningen University as a part of Wageningen University and Research Centre,
- Freiburg - Forestry Faculty was connected with Faculty of Earth Sciences which has led into the creation of Faculty of Forest and Environmental Sciences,
- Munich (1999) Forestry Faculty was moved from Ludwig-Maximilian-University to Munich University of Technology; the Faculty was liquidated in 2000 and as an academic faculty was included in the newly built Center of Food, Landuse and Environmental Sciences in Weihenstephan,
- Dresden (1993) creation of Faculty of Forest, Geo and Hydro Sciences,
- Joensuu - changing name from Faculty of Forest Sciences to Faculty of Science and Forestry.

### **The curricula in forestry**

Most of the forest faculties carried out the reform of forestry programs (also by introducing a two-level studies) in 1990. This action was independent of the Bologna Process - for this reason there was no coordination at the national or international level (Schuck 2009). The year 2004 ended with the introduction of a two-level Bologna education system. All the Faculties always offered at least one specialization at 2<sup>nd</sup> degree level (Table 2). Although usually one specialization at the 2<sup>nd</sup> degree level (two in Vienna) was a continuation of specialization at the 1<sup>st</sup> level degree, due to a wider range of courses, the majority of specialties were not a continuation of 1<sup>st</sup> level education (e.g. Tropical Forestry in Drezden, European Forestry in Joensuu, Sustainable Forestry and Land Use Management in Freiburg). On the majority of forest faculties, at the undergraduate level only one specialization was provided. The exception was the Faculty of Forestry and Soil Science in Vienna, where many specializations at the undergraduate and graduate level were offered. It should also be noted that some specializations were on the border between forestry and other disciplines, or even with a clear dominance of other subjects (e.g. Mountain Risk Engineering in Vienna). With most of the faculties on the 2<sup>nd</sup> degree, at least one specialization was conducted in English only.

### **Detailed characterization of the curriculum (the example of Freiburg and Vienna)**

#### **Forestry Studies in Freiburg (<http://www.forskningsdagene.no>)**

Faculty of Forest and Environmental Sciences is one of the faculties at the University of Freiburg (Albert-Ludwigs-Universität Freiburg). The University was founded in 1457, has 11 faculties, 6 interdisciplinary research centers, 65 subjects are conducted and the number of students is approximately 20 thousand.

Faculty of Forest and Environmental Sciences consists of 13 institutes, has 135 permanent staff (26 professors, 44 other researchers). Approximately 1,300 students, including only 80 graduate students study at the Faculty. There are also 250 PhD students. The Faculty deals with three subjects: forestry, geography and hydrology. Bachelor's degree lasts 6 semesters and a Masters degree 4 semesters.

Bachelor's degree specified as requiring 180 ECTS (European Credit Transfer System), including: 120 ECTS credits for main subjects, 40 ECTS for additional subjects and 20 ECTS for general skills. Specific items are:

- a preliminary module (3 weeks),
- foreign practice (2 months),
- preparation of thesis (3 months).

Main subjects are: Forestry and Environment, Geography. Additional subjects are:

- International Forestry,
- Forestry and Wood Industry,
- Development of Landscape and Nature Conservation,
- Environmental Science,
- Meteorology and Climatology,
- Geography.

In master's degree three specializations related to forestry are carried out:

- Forest Ecology & Management,
- European Forestry,
- Forest Sciences.

Specialization in Forest Ecology and Management is conducted in English and lasts for 4 semesters. In semesters 1-3 modules of subjects are conducted. Semester 4 is designed for writing the thesis. Those studies require 120 ECTS credits. There are 25 students on each year of studies. The fee is 500 Euros per semester.

The main objectives of the study in that specialization are:

- understanding and analyzing the direct and indirect human impacts on forests and other land ecosystems,
- understanding of ecological and environmental processes at different levels: cellular, individual, population, ecosystem, landscape and global,
- acquire methodical skills and knowledge needed to manage and plan development.

Subjects are arranged as follows:

1<sup>st</sup> semester:

- Global environmental changes
- Structure of trees and their functions
- Managing the human-environment interaction
- Statistics
- Optional subjects 1 and 2

2<sup>nd</sup> semester:

- Population and groups ecology
- Soil ecology and management
- The ecosystems management
- Optional subjects 3 and 4
- Foreign practice

3<sup>rd</sup> semester:

- Foreign practice (continuation)
- Eco-informatics and environmental monitoring
- Dealing with hazards and disasters
- Methods for the ecosystem analysis
- Forest resources and wood production
- Optional subject 5

4<sup>th</sup> semester:

- Preparation of master thesis

Specialization in European Forestry is conducted in English and is organized by six universities: Joensuu (Finland), which is a coordinating university, Freiburg (Germany), Uppsala and other places in Sweden, Lleida (Spain), Vienna (Austria) and Wageningen (Netherlands). Education takes four semesters, where 1<sup>st</sup> year is intended for basic courses and practices and 2<sup>nd</sup> year for optional subjects and writing master thesis. Those studies require 120 ECTS credits. There are 25 students on each year of studies. There is a system of scholarships for students, especially the ones from developing countries.

Subjects are arranged as follows:

1<sup>st</sup> year:

- Trends in European Forestry (Sweden)
- Social Communication (Finland)
- Ethics in the Forest Management (Finland)
- Field practice (Spain)
- Methodology of forest research (Finland)
- Global challenges in the local context (Finland)
- Multifunctional forestry in mountain regions (Austria)
- The practice in forest institutions

2<sup>nd</sup> year:

- Optional subjects at the partner universities

- Writing master thesis
- Master degree seminar

Forest Science specialization is conducted in Germany. It lasts 4 semesters. Subjects in the first 3 semesters are carried out in modules (3-9 weeks each). Semester 4 is designed for writing master thesis. Those studies require 120 ECTS credits. There are 25 students on each year of studies. The fee is 500 Euro per semester.

Main features are as follows:

- Modules last 3 weeks (5 ECTS each),
- Subjects end with exams,
- Mixed forms of teaching are used (lectures, seminars, practical exercises, excursions),
- The maximum number of students is 60 on obligatory subjects, 20 per additional subjects,
- Large proportion of optional courses meeting students' individual needs.

Subjects are arranged as follows:

1<sup>st</sup> semester:

- Forest Utilization and Nature Conservation
- Forestry and Environment Economics
- Forest and Environment (Conservation) Policy
- Statistics
- Optional subjects 1 and 2

2<sup>nd</sup> semester:

- Forest Silviculture and Protection
- Forest development and management
- Foreign practice

3<sup>rd</sup> semester:

- Foreign practice (continuation)
- Current topics 1 and 2

4<sup>th</sup> semester:

- Preparation of master thesis

### **Forestry Studies in Vienna (<http://www.boku.ac.at>, <http://www.wabo.boku.ac.at>)**

The Faculty of Forestry and Soil Science is located at University of Natural Resources and Life Sciences in Vienna (Universität für Bodenkultur Wien). The University was founded in 1872 and is composed of 15 faculties and 1 institute.

The Faculty of Forestry and Soil Science consists of 6 institutes and units called „Forest Demonstration Centre”. Bachelor's degree lasts 6 semesters and master degree 4 semesters. The main objectives of 1<sup>st</sup> level education are defined as follows: „Taking into account the stability of forest utilization, graduates should know production, conservation, social and recreational forest functions and be able to create plans for proceeding with fullest possible protection of natural resources.”

The study requires 180 ECTS credits and those include:

- 162 ECTS obligatory subjects (including thesis - 12 ECTS and practice - 3 ECTS)
- Elective courses (Forestry) 7 ECTS
- Elective courses (university-wide) 11 ECTS (including subjects in a foreign language 10 ECTS)

The division of hours of classes follows the rules:

- At least 25% of subjects related to technology and engineering,
- At least 25% of natural sciences,
- At least 25% of management, social and law subjects.

The aim of the diploma thesis is to develop a specific scientific problem. Theses are performed

in small groups (up to 4 people) or individually under the supervision of mentor.

The main objectives of Forest Science master study degree are the same as specified for the first cycle. They require 120 ECTS credits, including:

- Obligatory subjects 38 ECTS,
- Elective courses 45 ECTS,
- Elective courses (university-wide) 7 ECTS,
- Preparing of master thesis 30 ECTS.

The studies end with an examination conducted in front of the Examining Board.

Classes are held in the form of lectures, exercises, pre-seminars, seminars, tours, mixed activities (previously mentioned), interdisciplinary projects and diploma seminars. Three modules are obligatory:

- Analysis of forest ecosystems
- Management of forest resources
- Management and Policy

As well as:

- Master diploma seminars

It is necessary to pass at least five courses from the list of modules:

- Forest Politics
- Social Communication and Public Activity
- Special Production Systems
- History of Forestry, Hunting and Environment
- Managing the Company
- Forestry Economics
- Logistics
- Diagnostics of Forest Damage
- Integrated Forest Protection
- Knowledge about forest habitats
- Dynamics
- Condition and Development of Forests
- Genetic Diversity - a component of biodiversity in forest
- Forest Utilization Systems
- Wood
- Innovative Concepts of Forest Silviculture
- Planning and Decision Making in Forest Management
- Game Management
- Control of the Risk Factor in Mountain Forests
- Geoinformatics
- Interdisciplinary project

### **Conclusions**

Schuck (2009) works have provided valuable analytical material. Based on questionnaires filled by those responsible for implementing the curriculum and by students, data on the problems and expectations with respect to curricula and profiles of graduates was collected.

Selected results (and those which seem to be the most important) are as follows:

- There was a forest study change in the image. Changing the name of study programs from „forestry” to „forest” has contributed to that. This resulted in a transformation of the future graduates’ image from people involved in the traditional forest management to those involved in forest science (the use of knowledge).

- Universities have had no problems in recruiting candidates. However, the lack of exams caused that it was impossible to check the qualifications of candidates. The candidates were sometimes disappointed at the beginning of the study when the general subjects (such as physics or chemistry) evoked an impression of continuing education in earlier grades.
- Forestry Faculties usually offer one specialization in the first degree level and a few on masters degree. This resulted in difficulty in predicting how many people will apply on a particular specialization in the second degree and in controlling inflow of students.
- On the whole forest faculties expected that students would continue their studies at secondary level of education. However, in German universities (especially in Freiburg) it was expected that 30-50% of the students complete their studies at the first level of education degree.
- The creation of faculties teaching subjects related to forestry on other universities (vocational schools, polytechnics) caused confusion among future students and employers.
- During study global forest aspect was emphasized too little. It was better dealt on the international study programs.
- The future is perceived in co-operation between departments because not every university can offer everything that is needed and expected. On the other hand the organization of cooperation can be difficult. Some universities cooperate in the European Masters Programs (Swedish Euroforester or Master European of Forestry coordinated by Joensuu) or offer a double degree.
- The most important social expectations for forest education and skills of future graduates are as follows:
  - Full management of natural resources (sustainability in the economic, ecological and social sense),
  - Prevention of disasters that threaten forests,
  - Increasing involvement in international policy on forests,
  - Development of personal skills (presentation, a foreign language and communication skills),
  - The need to develop public awareness and participation in the management of natural goods (which are public goods, though often private property).
- The period of study at university forest faculties in Western and Northern Europe is different than in Poland - first level degree is shorter (one semester less) and the second level degree is longer (one semester more).

Table 1. Names of universities in selected countries, units conducting higher forest education and their foundation dates.

| Country | University  | Unit (Faculty)                                | Study from |
|---------|---|---|------------|
| Finland | University of Helsinki  | Faculty of Agriculture and Forestry           | 1982       |
| Finland | University of Joensuu   | Faculty of Science and Forestry               | 1907       |
| Austria | University of Natural Resources and Applied Life Sciences, Vienna | Department of Forest and Soil Sciences        | 1872       |
| Germany | University of Göttingen   | Faculty of Forest Sciences and Forest Ecology | 1868       |
| Germany | University of Freiburg  | Faculty of Forest and Environmental Sciences  | 1920       |

|         |                                  |  |      |
|---------|----------------------------------|--|------|
| Germany | Technical University of Munich   | School of Forest Science and Resource Management | 1878 |
| Germany | Dresden University of Technology | Faculty of Forest, Geo and Hydro Sciences        | 1811 |
| Holland | Wageningen University            | Department of Environmental Sciences             | 1918 |

Table 2. Programs of study on the 1<sup>st</sup> and 2<sup>nd</sup> degree level offered in selected forest faculties (dates of program implementation in brackets, names of programs in italics; programs conducted only in English in bold).

| University  | Bachelor   | Master  |
|---|--|---|
| University of Helsinki  | <i>Agriculture &amp; Forestry</i> (1994)   | <i>Forest Economics &amp; Marketing</i> (1994),<br><i>Forest Ecology &amp; Forest Resource Management</i> (1994)  |
| University of Joensuu   | <i>Agriculture &amp; Forestry</i> (1995)   | <i>Agriculture &amp; Forestry</i> (1982),<br><b><i>European Forestry</i></b> (2000)   |
| University of Natural Resources and Applied Life Sciences, Vienna | <i>Forest Science, Wood &amp; Fiber Technology, Technology, Management of Environment &amp; Bio Resources</i> (2004) | <b><i>Mountain Forestry</i></b> (2002),<br><b><i>Mountain Risk Engineering</i></b> ,<br><i>Forest Sciences, Wildlife Ecology &amp; Wildlife Management, Wood Technology &amp; Management, Management of Environment &amp; Bio Resources, Phytomedicine</i> (2004) |
| University of Göttingen   | <i>Forest Sciences &amp; Forest Ecology</i> (1999)   | <i>Tropical &amp; International Forestry; Forest Management; Nature Protection &amp; Forest Ecology; Wood Biology &amp; Wood Technology; Forest Ecosystem Analysis &amp; Information Management</i> (1999)  |
| University of Freiburg  | <i>Forestry &amp; Environment</i> (2005)   | <b><i>Forest Ecology &amp; Management</i></b> (2005),<br><b><i>European Forestry</i></b> (2009),<br><i>Forest Sciences</i> (2008)   |
| Technical University of Munich                                    | <i>Forest Science</i> (2000)   | <i>Forest Sciences &amp; Wood Technology</i> (2000),<br><b><i>Sustainable Resource Management</i></b> (2001)  |
| Dresden University of Technology                                  | <i>Forest Sciences</i> (1999)  | <i>Forest Sciences</i> (1999),<br><i>Tropical Forestry</i> (1993),<br><i>Wood Technology &amp; Marketing</i> (2004)   |
| Wageningen University   | <i>Forest &amp; Nature Conservation</i> (2000)   | <b><i>Forest &amp; Nature Conservation</i></b> (2002)   |



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